

REFLECTIONS
UPON
Ancient and Modern
LEARNING.

BY
WILLIAM WOTTON, B. D.
Chaplain to the Right Honourable the
EARL of NOTTINGHAM.

The Second Edition, with Large Additions.

WITH A
DISSERTATION
UPON
The EPISTLES of
PHALARIS, } EURIPIDES; &c.
THEMISTOCLES, } AND
SOCRATES, } ÆSOP'S FABLES.

By Dr. BENTLEY.

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Chancellor of the High Court of the
County of Nottingham

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THE APOSTLES

AND

THE GOSPELS

BY DR. BENTLEY

LONDON: Printed by J. Baskett, at the
Printers of the Royal Society, in the Strand.
MDCCLXXII.

TO THE
Right Honourable
DANIEL
Earl of NOTTINGHAM,
Baron FINCH of DAVENTRY.

May it please Your Lordship,

Since I am, upon many
Accounts, obliged to
lay the Studies and
Labours of my Life at
Your Lordship's Feet, it will
not, I hope, be thought Pre-
sumption in me to make this
following Address, which, on
my Part, is an Act of Duty.

The EPISTLE

I could not omit so fair an Opportunity of declaring how sensible I am of the Honour of being under Your Lordship's Patronage. The Pleasure of telling the World that one is raised by Men who are truly Great and Good, works too powerfully to be smothered in the Breast of him that feels it; especially since a Man is rarely censured for shewing it, but is rather commended for gratifying such an Inclination, when he thankfully publishes to whom he is indebted for all the Comforts and Felicities of his Life.

But Your Lordship has another Right to these Papers, which is equal to that of their
being

DEDICATORY.

being mine: The Matter it self directs me to Your Lordship. as the Proper Patron of the Cause, as well as of its Advocate. Those that enquire whether there is such a Spirit now in the World as animated the greatest Examples of Antiquity, must seek for living Instances, as well as abstracted Arguments; and those they must take care to produce to the best Advantage, if they expect to convince the World that they have found what they sought for.

This therefore being the Subject of this following Enquiry, it seemed necessary to urge the strongest Arguments

THE EPISTLE

first, and to prepossess the World in favour of my Cause, by this Dedication. For those that consider that the Vertues which make up a Great Character, such as Magnanimity, Capacity for the Highest Employments, Depth of Judgment, Sagacity, Elocution, and Fidelity, are united in as eminent a Degree in Your Lordship, as they are found asunder in the true Characters of the Ancient Worthies; that all this is rendred yet more Illustrious by Your Exemplary Piety and Concern for the Church of England, and Your Zeal for the Rights and Honour of the English Monarchy; and last

DEDICATORY

last of all, that these Vertues do so constantly descend from Father to Son in Your Lordship's Family, that its Collateral Branches are esteemed Public Blessings to their Age and Country; will readily confess that the World does still Improve, and will go no further than Your Lordship, to silence all that shall be so hardy as to dispute it.

Justice therefore, as well as Gratitude, oblige me to present these Papers to Your Lordship: Though, since I have taken the Freedom, in several Particulars, to dissent from a Gentleman, whose Writings have been very kindly received

THE EPISTLE, &c.

*in the World, I am bound to
declare, that the principal
Reason which induced me to
make this Address, was, not
to interest Your Lordship in my
small Disputes, but to let the
World see, that I have a Right
to subscribe my self,*

May it please Your Lordship,

Your Lordship's

Most Obliged,

And Most Dutiful

Servant and Chaplain,

WILLIAM WOTTON.

PREFACE.

THE Argument of these following Papers seems, in a great measure, to be so very remote from that Holy Profession, and from those Studies, to which I am, in a more particular manner, obliged to dedicate my self, that it may, perhaps, be expected I should give some Account of the Reasons which engaged me to set about it.

In the first place therefore, I imagined, that if the several Boundaries of *Ancient and Modern Learning* were once impartially stated, Men would better know what were still unfinished, and what were, in a manner, perfect; and consequently, what deserved the greatest Application, upon the score of its being imperfect: which might be a good Inducement to set those

those Men, who, having a great Genius, find also in themselves an Inclination to promote Learning, upon Subjects wherein they might, probably, meet with Success answerable to their Endeavours: By which means, Knowledge, in all its Parts, might at last be compleated. I believed likewise, that this might insensibly lead Men to follow such, and only such, for their Guides, as they could confide in for the Ablest and Best in those several kinds of Learning to which they intended to apply their Thoughts. He that believes the Ancient *Greeks* and *Romans* to have been the greatest Masters of the *Art of Writing* that have ever yet appeared, will read them as his Instructors, will copy after them, will strive to imitate their Beauties, and form his Stile after their Models, if he purposes to be excellent in that Art himself: All which things will be neglected, and he will content himself

P R E F A C E.

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himself to read them in their Translations, to furnish his Mind with Topics of Discourse, and to have a general Notion of what these Ancient Authors say, if he thinks he may be equally Excellent a nearer Way. To read *Greek* and *Latin* with Ease, is a thing not soon learn'd ; those Languages are too much out of the common Road ; and the Turn which the *Greeks* and *Latins* gave to all their Thoughts, cannot be resembled by what we ordinarily meet with in Modern Languages ; which makes them tedious, till mastered by Use. So that constant Reading of the most perfect Modern Books, which does not go jointly on with the Ancients, in their Turns, will, by bringing the Ancients into Dis-use, cause the Learning of the Men of the next Generation to sink ; by reason that they, not drawing from those Springs from whence these excellent Moderns drew, whom they only propose

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pose to follow, nor taking those Measures which these Men took, must, for want of that Foundation which these their Modern Guides first carefully laid, fail in no long Compass of Time.

Yet, on the other hand, if Men who are unacquainted with these things, should find every thing to be commended because it is *oldest*, not because it is *best*; and afterwards should perceive that in many material and very curious Parts of Learning, the Ancients were, comparatively speaking, grossly ignorant, it would make them suspect that in all other things also they were equally deficient; grounding their general Conclusion upon this common, tho' erroneous Principle, that because a Man is in an Error in those things whereof we can judge, therefore he must be equally mistaken in those things where we cannot. Now, this Extream can be no way more easily avoided,

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avoided, than by stating the due Limits of *Ancient* and *Modern Learning*; and shewing, in every Particular, to which we ought to give the Pre-eminence.

But I had another, and a more powerful Reason, to move me to consider this Subject; and that was, that I did believe it might be very subservient to Religion it self. Among all the Hypotheses of those who would destroy our most Holy Faith, none is so plausible as that of the *Eternity of the World*. The fabulous Histories of the *Ægyptians*, *Chaldeans* and *Chineses* seem to countenance that Assertion. The seeming easiness of solving all Difficulties that occur, by pretending that sweeping Floods, or general and successive Invasions of Barbarous Enemies, may have, by Turns, destroy'd all the Records of the World, till within these last Five or Six Thousand Years, makes it very desirable

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to those whose Interest it is, that the *Christian Religion* should be but an empty Form of Words, and yet cannot swallow the *Epicurean Whim-fies* of Chance and Accident. Now the Notion of the Eternity of Mankind, through infinite successive Generations of Men, cannot be at once more effectually and more popularly confuted, than by shewing how the World has gone on, from Age to Age, Improving; and consequently, that it is at present much more Knowing than it ever was since the earliest Times to which History can carry us.

But upon Examination of this Question, several Difficulties appeared, which were carefully to be removed. The greatest was, That some Sciences and Arts, of a very compounded Nature, seem really to have been more perfect anciently, than they are at present; which does, as it were, directly overthrow my Position.

Position. Therefore I was obliged, first, to enquire whether the Thing were true in Fact, or not : Next, If true, whether it proceeded from a particular Force of Genius, or from the Concurrence of some accidental Circumstances ; and also, whether, in case such Circumstances did concur, in other Things, where those Accidents could have no place, the Moderns did not out-doe the Ancients so much, as, allowing the World to be no older than the *Mosaical* Account, it were reasonably to be expected they should. For then, if all these Questions could be satisfactorily resolved, the Objection would be no Objection at all ; and Mankind might still be supposed to improve, even though in some Particulars they should go back, and fall short of the Perfection which once they had.

There is no question but these Excellencies of the Ancients might be

be accounted for, without hurting the *Mosaical* History, by resolving them into a particular Force of Genius, evidently discernible in former Ages, but extinct long since. But this seems to be of very ill Consequence, since it does, as it were, suppose that Nature were now worn out, and spent; and so may tempt a *Libertine* to think that Men, as Mushrooms are said to do, sprung out of the Earth when it was fresh and vigorous, impregnated with proper Seminal Atoms, now, of many Ages, no longer seen.

When nothing therefore appeared to be so likely to take off the Force of the main Objection, as the finding of particular Circumstances which might suit with those Ages that did exceed ours, and with those things wherein they did exceed us, and with no other Age nor Thing besides; I did at last please my self, that I had found these Circumstances; and in setting

setting them down, I took care, neither to be deceived my self, nor (as I hope) to deceive any Body else.

But what shall be said to those numerous Deluges, which, no Body knows how many Ages before that of Noah, are said to have carried away all Mankind, except here and there a Couple of ignorant Salvages, who got to some high Mountain, and from thence afterwards replemish'd the Earth? This Hypothesis (as these Men call it) is so very precarious, that there needs nothing to be replied to it, but only that it is as easily disproved by Denying, as defended by Asserting, since no Records nor Traditions of the Memory of the Facts are pretended; and something easier, because it may be demonstrably proved, that a general Flood cannot be effected without a Miracle, and if it could, that it must destroy the whole Race of Mankind, unless some few should be preserved;

as the Holy Scriptures assure us *Noah* was, who then would preserve the Memory of their own Deliverance, which destroys our *Libertines* Hypothesis. Now, partial Deluges are not sufficient : If one Country be destroyed, another is preserved ; and if the People of that Country have Learning among them, they will also have a Tradition, that it once was in the other Countries too, which are now dis-peopled.

Upwards, as far as the Age of *Hippocrates*, Knowledge may be traced to its several Sources : But of any Histories older than the *Mosaical*, there are no sort of Foot-steps remaining, which do not, by their Contradictions, betray their Falshood ; setting those aside which *Moses* himself has preserved. If any should pretend to solve the Difficulty, by supposing Invasions of Barbarous Enemies, which may have destroy'd the Memory of all past Knowledge, they

they will soon see new Difficulties arise, instead of having the old ones removed. There is Reason to suppose that Invasions of Barbarous Enemies were anciently of the same Nature, as they have been since; that is, they might possibly make entire Conquests of the Countries which were so invaded; but we cannot suppose that any of these pretended *Ante-Mosaical* Conquests, of which we are now speaking, made a greater Alteration than that which the *Goths* and *Vandals* made in the *Roman Empire*; that which the *Saracens* first, and the *Turks* afterwards made in the *Greek*; or that of the *Tartars* in *China*. The *Goths* and *Vandals* had scarce any Learning of their own; and if we consider Politeness of Manners, and nothing else, they seem truly to have deserved the Name of *Barbarous*: They therefore took some of the *Roman Learning*, as much as they thought was for their Turn, the

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Memory

Memory whereof can never be said to have been quite extinct during the whole Course of those ignorant Ages which succeeded, and were the Effects of their Conquests. The Saxons in England, being taught by the British Refugees, who planted themselves in Ireland, and from thence, by the Way of Scotland, came by degrees back again into their own Country, had as much, if not more Learning than any of their European Neighbours. The Saracens applied themselves to Learning in earnest, as soon as the Rage of their first Wars was over; and resolving to make theirs a compleat Conquest, robb'd the Greeks of their Knowledge, as soon as they had possessed themselves of the most valuable Parts of their Empire. The Turks have learnt enough, not to be thought illiterate, though less proportionably than any of the forementioned Conquerors: They can Write and Read; they preserve some

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rude Annals of their own Exploits, and general Memorials, it matters not how imperfect of precedent Times: And they have lost none of the Mechanical Arts that they had occasion for, which they found in the Countries where they came, since they either work themselves, or employ others that shall; which, to the present Purpose, is all one. The *Tartars* have, since their Conquest, incorporated themselves with the *Chinese*, and are now become one People, only preserving the Authority still in their own Hands.

In all these Instances one may observe, that how barbarous soever these several Conquerors were when first they came into Civilized Countries, they, in time, learnt so much at least of the Arts and Sciences of the People whom they subdued, as served them for the necessary Uses of Life; and thought it not beneath them to be instructed by those to
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whom they gave Laws. Wherefore there is Reason to believe, that since Mankind has always been of the same Make, former Conquests would have produced the same Effects, as we see later ones have done. In short, We cannot say that ever any one Invention of considerable Use has been laid aside, unless some other of greater and more general Use has come in the room of it, or the Conquerors took it away, for some Political Reason, either letting it totally die, or supplying it with something else, which to them seemed a valuable Equivalent. Have any of these Conquerors, since *Tubal-Cain's* Time, once suffered the Use of Metals, Iron for instance, or Gold, to be lost in the World? Hath the Use of Letters been ever intermitted since the Time of that *Cadmus*, whoever he was, that first found them out? Or, was Mankind ever put to the trouble of Inventing them a second time?

time ? Have the Arts of Planting, of Weaving, or of Building, been at any time, since their first Invention, laid aside ? Does any Man believe that the Use of the *Load-stone* will ever be forgotten ? Are the *Turks* so barbarous, or so spiteful to themselves, that they will not use Gunpowder, because it was taught them by *Christians* ? Does not *Garçilasso de la Vega* inform us, that the *Peruvians* would have worshipped the *Spaniards* as Gods, if their Cruelties had not soon led these harmless People to take them to be something else, because they taught them the Use of *Iron* and *Looking-Glasses* ? (Whence we may be sure that this innocent and honest Nation never had Learning amongst them before.) Do not we find, that they and the *Mexicans*, in the compass of Four or Five Hundred Years, which is the utmost Period of the Duration of either of their Empires, went on still

Improving? (As the whole *New World* would, probably, have done in not many Ages, if these two mighty Nations had extended their Conquests, or if new Empires had arisen, even though the *Spaniards* had never come among them; since those two Empires of *Mexico* and *Pern*, which were the only considerable Civilized Governments in *America*, got constant Ground of their Enemies; having the same Advantages over them, as formed Troops have over a loose Militia.) Or, can we think that they would again have relapsed to their old Barbarity of themselves, when once they had been weary of those Arts, and of that Learning (such as it was) which then they had? Men are not such stupid Creatures, but if an Invention is at any time found out, which may do them great and eminent Service, they will learn it, and make use of it, without enquiring who it is they learn

learn it of ; or taking a Prejudice at the Thing , because, perhaps, they may be indebted to an Enemy for it. *Barbarous* and *Polite* are Words which rather referr to Matters of *Breeding* and *Elegance*, than of *Sound Judgment*, or *Good Sense* ; which first shew themselves in making Provision for Things of Convenience, and evident Interest, wherein Men scarce ever commit palpable Mistakes. So that it is unaccountable that the History of Learning and Arts should be of so confessedly late a Date, if the Things themselves had been many Ages older ; much more if the World had been Eternal.

Besides these, I had a Third Reason to engage me to this Undertaking ; which was, the Pleasure and Usefulness of those Studies to which it necessarily led me : For Discoveries are most talked of in the Mechanical Philosophy, which has been but lately revived in the World.

Its

Its Professors have drawn into it the whole Knowledge of Nature, which, in an Age wherein Natural Religion is denied by many, and Revealed Religion by very many more, ought to be so far known at least, as that the Invisible Things of the Godhead may be clearly proved by the Things that are seen in the World. Wherefore I thought it might be Labour exceedingly well spent, if, whilst I enquired into what was anciently known, and what is a new Discovery, I should at the same time furnish my Mind with new Occasions of admiring the boundless Wisdom and Bounty of that Almighty and Beneficent Essence, in and by whom alone this whole Universe, with all its Parts, live, and move, and have their Being.

I had also a fresh Inducement to this Search, when I found to how excellent purpose my most Learned and Worthy Friend, Dr. Bentley, had, in his late incomparable Discourses

courses against *Atheism*, shewn what admirable Use may be made of an accurate Search into Nature, thereby to lead us directly up to its Author, so as to leave the unbelieving World without Excuse.

But, after all that I have alledged for my self, I must acknowledge, that I soon found that I did not enough consider *Quid valeant humeri, aut quid ferro recusent*. The Subject was too vast for any one Man, much more for me, to think to do it Justice; and therefore, as soon as I had drawn up a rude Scheme of the Work, I intended to have given it over, if the importunate Sollicitations of my very Ingenious Friend, *Anthony Hammond*, Esq; had not at last prevailed upon me to try what I could say upon it: And it was so difficult a Thing to me to refuse what was so earnestly pressed by a Person who was so very dear to me, and which in the present Case was a great deal more,

more, One, for whose Sence and Judgment, all that know him have so very particular a Regard, that I resolved at last, rather to hazard my own Reputation, than to deny his Request; especially, since I hoped that it might, perhaps, give some Body else an Opportunity to compleat that, of which this Treatise is a very imperfect Essay.

I hope I need make no Apology, that a great Part of this Discourse may seem too Polemical for a Writing of this kind: For that could not be well avoided, because the Argument it self has been so much debated. The ablest Men of the two opposite Parties, are, Sir *William Temple*, and Monsieur *Perrault*: They are two great Men, and their Writings are too well known, and too much valued, to be over-looked. They cloath their Thoughts in so engaging a Dress, that a Man is tempted to receive all they say, without

without Examination; and therefore I was afraid that I might have been accused of betraying my Cause, if, whilst I endeavoured throughout the whole Controversie to act the Part of a Mediator, and to give to every Side its just due, I had omitted what these two elegant Advocates had severally alledged for their respective Hypotheses.

What Censure the World will pass upon my Performance, I know not; only I am willing to think, that those who shall not agree to what I say, will grant that I have represented the Opinions of other Men with Impartiality and Candour, and that I have not discovered any Bigottry or Inclination to any one particular Side; which will be a good Step to make them believe, that I shall not obstinately defend any one Position, which may hereafter be proved to be erroneous.

June 11.

1694

P O S T.

POSTSCRIPT

Since the *Second Edition* of my Book was Printed off, we have had an Account in the *Journal des Sçavans*, that Monsieur Perrault has publish'd a **THIRD PART** of his *Parallel between the Ancients and the Moderns*; in which he undertakes to prove, that the Skill of the Moderns in *Geography, Philosophy, Medicine, Mathematics, Navigation, &c.* is preferable to that of the Ancients. The Book is not yet, that I know of, in *England*, and possibly may not be procurable in some time. I thought it necessary, however, to take notice, that I have had a bare Intimation of such a Book, and no more; that so if in any *Material Things* we should happen to Agree, (as writing upon the same Argument, tis very probable

bable we may,) I might not hereafter be thought a Plagiary. There was no danger hitherto; since as far as he had gone before, I either openly dissented from him, or directly abridged his Words.

Page 220. I have, upon his own Authority, given *Columbus* the Credit of Discovering that little Bone in the Inner Cavity of the Ear, which, from its figure, is commonly call'd the *Stirrup*: And indeed, he being the first that ever mention'd it in Print, and pretending that it was his own Invention, seems to have the fairest Plea to the Honour of it. But *Philippus Ingrassias*, who wrote some time before *Columbus*, certainly knew it: For, in his Commentary upon *Galen de Offibus*, he expressly mentions it; and for that Reason, *Falloppius*, who could not want Opportunity of being truly inform'd, and was a right honest Man, and a judicious Anatomist,

Anatomist, and one to whom many Discoveries are owing, ascribes it to him in such Terms as put the Controversie beyond dispute. *Tertium* (says Falloppius, speaking of the little Bones in the Inner Cavity of the Ear) *si nolumus debita laude quenquam defraudare, invenit & promulgavit primus Johannes Philippus ab Ingrassia Siculus Philosophus ac Medicus Doctissimus dum Neapolitano in Gymnasio publicè Anatomem doceret :* And a little after; *Deus tamen gloriosus scit Ingrassiæ fuisse inventum ; atque cum Stapedis aut Staffæ nostrorum Patrum effigiem gestet, merito Stapedis nomine ab eodem fuisse donatum.* Had Ingrassias's Book been printed in his Lifetime, there had never been room for a Dispute ; though his Right was so well known, that Bartholomæus Eustachius, who wrote soon after Columbus, and put in his Claim to the Glory of the Discovery,

covery, mentions *Ingrassias's* Pretences, which *Columbus* does not.

Some, perhaps, will think this Enquiry into the Author of this Discovery, to be a needless Affectation of Exactness. But 'tis so much the Duty of all Writers, not to mislead their Readers in the smallest Particular, that they are obliged to rectifie their own Mistakes where-ever they find them, and not to be afraid of being accused of Negligence; since Truth, and not Glory, ought to be the ultimate End of all our Labours and Enquiries.

I am obliged also to take notice, that I have lately got a sight of *Servetus's Christianismi Restitutio*, out of which that famous Passage concerning the Circulation of the Blood, which I set down at length, p. 230. was copied long ago by that worthy Member of the Royal Society, Mr. *Abraham Hill*, from whom Mr. *Bernard*

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had it. My Lord Bishop of *Norwich*, whose incomparable Library contains every thing that is rare and excellent, did me the honour to show it me. His Manuscript Copy is a Transcript of that Printed one which is preserved in the *Landtgrave* of *Hesse's* Library at *Cassels*; the very Book that was perused by *Sandins*, who gives an Account of it in his *Bibliotheca Antitrinitariorum*. The Book it self was Printed (at *Basil*, says *Sandins*) in *MDLIII*. and is a Collection of all *Servetus's* *Theological Tracts*, though considerably enlarged: Some of which, and particularly his *Discourses concerning the Trinity*, had been published *XX* Years before. This I mention, because, if what *Servetus* says of the Passage of the Blood through the Lungs be in the former Edition, the Discovery has so much the greater Antiquity. The Passages now in question, are
in

in the *Fifth Book of the Trinity*,
where he treats of the *Holy Ghost* :

There he takes pains to
prove, (a) that the Sub-
stance of the Created Spi-
rit of *Jesus Christ* is Es-
sentially joined to the Sub-
stance of the *Holy Ghost*. To explain

(a) He says he intro-
duces this Disputation,
ut inde intelligas ipsi Spi-
ritus Sancti Substantia esse
essentialiter adjunctam cre-
ati Spiritus Christi Sub-
stantiam.

this, he talks much of God's Breath-
ing the Soul into Man, which, by
his manner of Explication, it is plain,
he believed to be Material. The

Way he proceeds is this : ' He sup-
' poses Three Spirits in Man's Body,

' *Natural, Vital, and Animal* ; which

' (says he) are (b) really not Three,

' but Two distinct Spirits. The

' *Vital* is that which is communi-

' cated by *Anastomoses* from the

' Arteries to the Veins, in which

' it is called *Natural*. The *Blood*

' therefore is *First*, whose Seat is

' *Naturalis*. Primus ergo est Sanguis, cujus sedes est in hepate

& Corporis Venis. Secundus est Spiritus vitalis, cujus sedes est in corde,

& corporis arteriis. Tertius est spiritus animalis, quasi lucis radius, cujus

sedes est in cerebro & corporis nervis.

(b) Quæ
Vere non
sunt tres,
sed duo Spi-
ritus di-
stincti. Vi-
talis est spi-
ritus qui
per Anasto-
moses ab
Arteriis
communi-
catur Ve-
nis, in qui-

‘ in the Liver and Veins : The
 ‘ *Vital Spirit* is *Second*, whose Seat
 ‘ is in the Heart and Arteries :
 ‘ The *Animal Spirit* is *Third*,
 ‘ which is like a Ray of Light,
 ‘ and has its Seat in the Brain and
 ‘ Nerves.’ So that he makes the
 beginning of the whole Operation
 to be in the Liver ; which, ac-
 cording to him, is the original
 Work-house of the Blood, which
 he calls the *Soul* or *Life*, as it is
 called in the Old Testament.

Now to understand how the
 Blood is the Life, he

(c) *Ad quam rem est
 prius intelligenda substan-
 tialis Generatio ipsius Vi-
 talis Spiritus, qui ex Aëre
 inspirato & subtilissimo san-
 guine componitur & nutri-
 tur : Vitalis spiritus in
 sinistro cordis Ventriculo
 suam originem habet, ju-
 vantibus maxime pulmo-
 nibus ad ipsius generatio-
 nem. Est spiritus tenuis,
 caloris vi elaboratus, flavo
 colore, ignea potentia, ut sit
 quasi ex puriore sanguine
 lucens vapor, substantiam
 continens aqua, aeris &*

says, (c) ‘ We must first
 ‘ understand the substan-
 ‘ tial Generation of the Vi-
 ‘ tal Spirit, which is com-
 ‘ pounded of, and nou-
 ‘ rished by Inspired Air,
 ‘ and the subtillest part of
 ‘ the Blood : The *Vital*
 ‘ Spirit has its original
 ‘ in the left Ventricle of
 ‘ the

the Heart, by the assistance of the Lungs, which chiefly contribute to its generation. It is a *subtile* Spirit (so I render *tenuis* here) wrought by the force of Heat; of a florid Colour, having the power of Fire: so that it is a sort of shining Vapour made of the purer part of the Blood, containing within it self the substance of Water, Air and Fire. It is made in the Lungs, by the mixture of Inspired Air with that Elaborated Subtile Blood which the Right Ventricle of the Heart communi-

gnis generatur ex factâ in pulmone mixtione inspirati aeris cum elaborato subtili sanguine, quem dexter ventriculus sinistro communicat. Fit autem communicatio hac non per parietem cordis medium, ut vulgo creditur, sed magno artificio à dextro cordis ventriculo, longo per pulmones ductu, agitur sanguis subtilis: à pulmonibus præparatur, flavus efficitur, & à venâ arteriosâ in arteriam venosam transfunditur; deinde in ipsâ arteriâ venosâ inspirato aëri miscetur, & expiratione à fuligine repurgatur: atque ita tandem à sinistro cordis ventriculo totum mixtum per Diastolen attrahitur, apta supellex ut fiat spiritus vitalis.

Quod ita per pulmones fiat communicatio & præparatio, docet conjunctio variâ & communicatio venæ arteriosæ cum arteriâ venosâ in pulmonibus. Confirmat hoc magnitudo insignis venæ arteriosæ, quæ nec talis nec tanta facta esset, nec tantam à corde ipso vim purissimi sanguinis in pulmones emitteret ob solum eorum nutrimentum, nec cor pulmonibus hac ratione serviret, cum præsertim antea in embryo-

solerent pulmones ipsi aliunde nutrirî ob membranulas seu Cordis usque ad horam natiuitatis nondum apertas, ut docet Galeus.

‘ cates to the Left. Now this Com-
‘ munication is not made through
‘ the *Septum* of the Heart, as is
‘ commonly believed, but the subtil
‘ Blood is very artificially agitated
‘ by a long passage through the
‘ Lungs from the right Ventricle of
‘ the Heart, and is prepared, made
‘ florid by the Lungs, and trans-
‘ fused out of the *Arterious Vein*
‘ into the *Venous Artery*, and at last
‘ in the *Venous Artery* it self it is
‘ mixed with the inspired Air, and
‘ by exspiration purged from its
‘ Dregs. And thus at length the
‘ whole Mixture is attracted, by the
‘ *Diafbole* of the Heart, into the left
‘ Ventricle, being now a fit Sub-
‘ stance out of which to form the
‘ Vital Spirit.

‘ Now that this Communication
‘ and Preparation is made by the
‘ Lungs, is evident from the various
‘ Conjunction and Communication
‘ of the *Arterious Vein* with the
‘ *Venous*

‘ *Venous Artery* in the Lungs ; the
 ‘ remarkable largeness of the *Arte-*
 ‘ *rious Vein* does likewise confirm
 ‘ it : since it would never have
 ‘ been made of that Form and Bulk,
 ‘ nor would it have emitted so
 ‘ great a quantity of very pure
 ‘ Blood out of the Heart into the
 ‘ Lungs, if it had been only for
 ‘ their Nourishment : nor would
 ‘ the Heart have been this way ser-
 ‘ viceable to the Lungs, since the
 ‘ *Fœtus* in the Womb are other-
 ‘ wise nourished, by reason of the
 ‘ closeness of the Membranes of the
 ‘ Heart, which are never opened
 ‘ till the Birth of the Child, as *Galen*
 ‘ teaches.’ So that the whole Mix-
 ‘ ture of Fire and Blood is made
 ‘ in the Lungs where there is a
 ‘ (d) ‘ Transfusion out of the *Ar-*
 ‘ *terious Vein* into the *Venous Artery*,
 ‘ which *Galen* took no notice of.

(d) Trans-
fuso à venâ

arteriosâ ad arteriam venosam propter spiritum, à Galeno non animad-
versa.

(e) Ille itaque spiritus
vitalis à sinistro cordis ven-
triculo in arterias totius
corporis deinde transfun-
ditur, ita ut qui tenuior
est, superiora petat, ubi ma-
gis adhuc elaboratur, prae-
cipue in plexu retiformi sub
basi cerebri sito, ubi ex
vitali fieri incipit animalis
ad propriam rationalis a-
nimæ rationem accedens.

Afterwards he says, (e) ‘ That
‘ this *Vital Spirit* is trans-
‘ mitted from the left
‘ Ventricle of the Heart
‘ into the Arteries of the
‘ whole Body, so that
‘ the more subtile Parts
‘ get upwards where they
‘ are yet more refined,
‘ especially in the *Plexus Retiformis*,
‘ which lies in the Base of the Brain,
‘ where, from *Vital*, it begins to
‘ become *Animal*, and approaches to
‘ the proper Nature of the Rational
‘ Soul.’

This he reasons long upon, to
prove, that the Blood is the Soul of
Man, and seems to allow no other
but what is thus made ; first elabo-
rated in the Liver, thence carried
by the Veins into the right Ven-
tricle of the Heart, and so into the
Lungs ; where being mix’d with
Air, it becomes Vital ; and after-
wards being carried by the Arteries
into

into the Brain, it is there further sublimed, till it receives its last Perfection, so as to be fit to perform the noblest Operations of the Animal Life.

If we compare now this Notion thus explained by *Servetus*, with *Dr. Harvey's Theory of the Circulation of the Blood*, we shall plainly see that he had imperfect Glimmerings of that Light which afterwards *Dr. Harvey* communicated with so bright a Lustre to the learned World: Which Glimmerings, since they were so true, having nothing in them of a False Fire, I much wonder that he went no further; though at the same time I cannot but heartily congratulate the Felicity of my own Country, which produced the Man that first saw the Importance of these noble Hints which he improved into a Theory, and thereby made them truly useful to Mankind.

Before

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Before

Before I conclude this *Postscript*, it will be expected, perhaps, that I should say something concerning this New Edition. I have taken the liberty which all Men have ever allowed, to Alter and Add where I thought any thing was faulty or deficient, and now and then I omitted some few Passages that did not so immediately relate to the design of the Book.

By one of these Additions, that of *Surgery*, which Mr. *Bernard* put in at my request, it will be yet further seen, that I would have nothing allowed to the Moderns, where the Cause will not strictly bear it. I had conceded so much to them before, that it was generally thought I was bias'd on their behalf: It was not enough to tell the World I was of no Side, the contrary was taken for granted, since in so many Particulars I actually gave them the Pre-eminence, when Sir *W. T.* had given it them almost

almost in nothing. I must own, I was glad it could be proved that the World has not actually lost its Vigour, but that a gradual Improvement is plainly visible; which this Instance that Mr. Bernard has so incontestably made out, does by no means contradict. For *Surgery*, though it is the certaineſt, yet it is the ſimpleſt part of *Medicine*; There the Operator is more let into his Work, which does not depend ſo much upon Conjecture as *Phyſic*. The reproach therefore of its comparatively ſmall Proficiency, is to be laid upon the *Men*, not the *Art*; it has been for theſe laſt Ages eſteemed too Mechanical for Men of Liberal Education, and fine Parts, to buſie themſelves about: So that I queſtion not but if as many learned Men had cultivated *Surgery* for theſe laſt CCC Years, as have employed themſelves in ſome other
Parts

Parts of Natural and Mathematical Learning, it would have met with as proportionable an Encrease; unless we should say, that it is already come to its highest Perfection; which, whether it be or no, I cannot pretend to decide.

The entire Discourses which are added, are printed by themselves, for the Satisfaction of those who have bought the First Edition, and have no Curiosity to compare that with the Second. But I have not re-printed those lesser Additions which are interwoven into the Body of the Book, both because they would appear only like a parcel of loose Scraps, and because something was to be done in compliance to the Book-seller, who, (having once more, at a time when Printing labours under so great Discouragements, ventured to

to publish so large a Book which
so few People will care to read)
desired that this Second Edition
might be made as Valuable to him
as well it cou'd.

April 30.
1697.

CON-

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REFLE.

(1)

REFLECTIONS
UPON
Ancient and Modern
LEARNING.

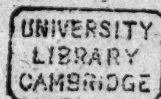
CHAP. I.

*General Reflections upon the State
of the Question.*

THE present State of the Designs and Studies of Mankind is so very different from what it was CL Years ago, that it is no Wonder if Men's Notions concerning them vary as much as the Things themselves. This great Difference has arisen from the Desire which every Man has, who believes that he can do greater Things than his Neighbours, of letting them see how much he does excel them: For that will necessarily oblige him to omit no Opportunity that offers it self to do it, and

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after-



Reflections upon

afterwards to express his Satisfaction that he has done it. This is not only visible in particular Persons, but in the several Ages of Mankind, (which are only Communities of particular Persons, living at the same time,) as often as their Humours, or their Interests, lead them to pursue the same Methods. This Emulation equally shews it self, whatsoever the Subject be, about which it is employed; whether it be about Matters of Trade, or War, or Learning, it is all one: One Nation will strive to out-do another, and so will one Age too, when several Nations agree in the pursuit of the same Design; only the Jealousie is not so great in the Contest for Learning, as it is in that for Riches and Power; because these are Things which enable their Possessors to do their Neighbours greater mischief proportionably as they possess them, so that it is impossible for bordering Nations to suffer with any patience that their Neighbours should grow as great as they in either of them, to their own prejudice; though they will all agree in raising the Credit of the Age they live in upon the Account of these Advantages, that being the only Thing wherein their Interests do perfectly unite.

If this Way of Reasoning will hold, it may be asked how it comes to pass, that the

the Learned Men of the last Age did not so generally pretend that they out-did the Ancients, as our present Learned Men do now : They would, without question, could they have had any Colour for it : It was the Work of one Age to remove the Rubbish, and to clear the Way for future Inventors. Men seldom strive for Mastery, where the Superiority is not in some sort disputable ; then it is that they begin to strive : Accordingly, as soon as there was a fair Pretence for such a Dispute, there were not wanting those who made the most of it, both by exalting their own Performances, and disparaging every Thing that had been done of that kind by their Predecessors. Till the New Philosophy had gotten ground in the World, this was done very sparingly ; which is but within the compass of XL or L Years. There were but few before, who would be thought to have exceeded the Ancients, unless it were some Physicians, who set up *Chymical* Methods of Practice, and Theories of Diseases, founded upon *Chymical* Notions, in opposition to the *Galenical* : But these Men, for want of conversing much out of their own Laboratories, were unable to maintain their Cause to the general Conviction of Mankind : The Credit of the Cures which

they wrought, not supporting them enough against the Reasonings of their Adversaries.

Soon after the Restauration of King *Charles II.* upon the Institution of the *Royal Society*, the Comparative Excellency of the Old and New Philosophy was eagerly debated in *England*. But the Disputes then managed between *Stubbe* and *Glanville*, were rather Particular, relating to the *Royal Society*, than General, relating to Knowledge in its utmost extent. In *France* this Controversie has been taken up more at large: The *French* were not satisfied to argue the Point in Philosophy and Mathematicks, but even in Poetry and Oratory too; where the Ancients had the general Opinion of the Learned on their Side. *Monfieur de Fontenelle*, the celebrated Author of a Book concerning the *Plurality of Worlds*, begun the Dispute about six Years ago, in a little Discourse annexed to his *Pastorals*. He is something shy in declaring his Mind; at least, in arraigning the Ancients, whose Reputations were already established; though it is plain, he would be understood to give the Moderns the Preference in Poetry and Oratory, as well as in Philosophy and Mathematicks. His Book being received in *France* with great Applause, it was opposed

posed in *England* by Sir *William Temple*, who, in the *Second Part* of his *Miscellanea*, has printed an *Essay* upon the same Subject. Had Monsieur *de Fontenelle's* Discourse passed unquestion'd, it would have been very strange; since there never was a New Notion started in the World, but some were found who did as eagerly contradict it.

The Hypothesis which Sir *William Temple* appears for, is received by so great a Number of Learned Men, that those who oppose it, ought to bring much more than a positive Affirmation; otherwise, they cannot expect that the World should give Judgment in their Favour. The Question now to be asked, has formerly been enquired into by few, besides those who have chiefly valued Oratory, Poesie, and all that which the *French* call the *Belles Lettres*; that is to say, all those Arts of Eloquence, wherein the Ancients are of all hands agreed to have been truly excellent. So that Monsieur *de Fontenelle* took the wrong Course to have his Paradox be believed; for he asserts all, and proves little; he makes no Induction of Particulars, and rarely enters into the Merits of the Cause: He declares, that he thinks Love of Ease to be the reigning Principle amongst Mankind; for which Reason,

B 3

perhaps,

perhaps, he was loth to put himself to the trouble of being too minute. It was no wonder therefore if those to whom his Proposition appeared entirely New, condemned him of *Sufficiency, the worst Composition out of the Pride and Ignorance of Mankind.*

However, since his Reasonings are, in the main, very just, especially where he discourses of the Comparative Force of the Genius's of Men in the several Ages of the World, and of the Equal Force of Mens Understandings absolutely considered in all Times since Learning first began to be cultivated amongst Mankind, I resolved to make some Enquiry into the Particulars of those Things which are asserted by some to be Modern Discoveries, and vindicated to the Ancients by others.

The General Proposition, which Sir *William Temple* endeavours to prove in his *Essay*, is this, " That if we reflect
 " upon the Advantages which the Ancient *Greeks* and *Romans* had, to improve themselves in Arts and Sciences,
 " above what the Moderns can pretend to ; and upon that Natural Force of Genius, so discernible in the earliest Writers, whose Books are still extant, which
 " has not been equalled in any Persons
 " that

“ that have set up for Promoters of Know-
“ ledge in these latter Ages; and com-
“ pare the Actual Performances of them
“ both together, we ought in Justice to
“ conclude, that the Learning of the pre-
“ sent Age, is only a faint, imperfect
“ Copy from the Knowledge of former
“ Times, such as could be taken from those
“ scatter'd Fragments which were saved
“ out of the general Shipwreck.

The Question that arises from this Proposition will be fully understood, if we enquire, (1.) Into those Things which the Ancients may have been supposed to bring to Perfection, (in case they did so,) not because they excelled those that came after them in Understanding, but because they got the Start by being born first. (2.) Whether there are any Arts or Sciences which were more perfectly practised by the Ancients, though all imaginable Care hath been since used to equal them. (3.) Whether there may not be others wherein they are exceeded by the Moderns, though we may reasonably suppose that both Sides did as well as they could.

When such Enquiries have once been made, it will be no hard matter to draw such Inferences afterwards, as will enable us to do Justice to both Sides.

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It must be owned, that these Enquiries do not immediately resolve the Question which Sir *William Temple* put, for he confounds two very different Things together; namely, *Who were the Greatest Men, the Ancients, or the Moderns?* and, *Who have carried their Enquiries farthest?* The first is a very proper Question for a Declamation, though not so proper for a Discourse, wherein Men are supposed to reason severely; because, for want of Mediums whereon to found an Argument, it cannot easily be decided: For, though there be no surer Way of judging of the Comparative Force of the Genius's of several Men, than by examining the respective Beauty or Subtilty of their Performances; yet the good Fortune of appearing first, added to the Misfortune of wanting a Guide, gives the first Comers so great an Advantage, that though, for instance, the *Fairy Queen*, or *Paradise Lost*, may be thought by some to be better Poems than the *Ilias*; yet the same Persons will not say but that *Homer* was at least as great a Genius as either *Spencer* or *Milton*. And besides, when Men judge of the Greatness of an Inventors Genius barely by the Subtilty and Curiosity of his Inventions, they may be very liable to Mistakes in their Judgments, unless they know and are able to judge of the Easiness

Ancient and Modern Learning.

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or Difficulty of those Methods, or Ratiocinations, by which he arrived at, and perfected these his Inventions ; which, with due Allowances, is equally applicable to any Performances in Matters of Learning of any sort.

It will however be some Satisfaction to those who are concerned for the Glory of the Age in which they live, if, in the first place it should be proved, That as there are some parts of real and useful Knowledge, wherein not only great Strictness of Reasoning, but Force and Extent of Thought is required thoroughly to comprehend what is already invented, much more to make any considerable Improvements, so that there can be no Dispute of the Strength of such Men's Understandings, who are able to make such Improvements ; so in those very Things, such, and so great Discoveries have been made, as will oblige impartial Judges to acknowledge, that there is no probability that the World decays in Vigour and Strength, if (according to Sir *William Temple's* Hypothesis) we take our Estimate from the Measure of those Men's Parts, who have made these Advancements in these later Years ; especially, if it should be found that the Ancients took a great deal of Pains upon these very Subjects, and had able Masters to

to instruct them at their first setting out: And, Secondly, If it should be proved, that there are other curious and useful Parts of Knowledge, wherein the Ancients had as great Opportunities of advancing and pursuing their Enquiries, as the Moderns, which were either slightly passed over, or wholly neglected, if we set the Labours of some few Men aside: And, Lastly, If it should be proved, that by some great and happy Inventions, wholly unknown to former Ages, new and spacious Fields of Knowledge have been discovered, and, pursuant to those Discoveries, have been viewed, and searched into, with all the Care and Exactness which such noble Theories required. If these Three Things should be done, both Questions would be at once resolved, and Sir William Temple would see that the Moderns have done something more than Copy from their Teachers, and that there is no absolute necessity of making all those melancholy Reflections upon (a) the Sufficiency and Ignorance of the present Age, which he, moved with a just Resentment and Indignation, has thought fit to bestow upon it.

(a) Pag. 5.
55, 56.

How far these Things can or cannot be proved, shall be my Business in these following Papers to enquire. And in these Enquiries

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ries I shall endeavour to act the part of a Mediator as nicely as I can, that so those who may not perhaps be satisfied with the Force of my Reasonings, yet may acknowledge the Impartiality of him that makes use of them. But First, Of those Things wherein, if the Ancients have so far excelled as to bring them to Perfection, it may be thought that they did it because they were born before us.

CHAP. II.

*Of the Moral and Political Knowledge
of the Ancients and Moderns.*

I Have often thought that there could not be a pleasanter Entertainment to an inquisitive Man, than to run over the first Reasonings which he had in his Infancy, whilst he was gathering his Collection of *Idea's*, and labouring to express those Sounds, by which he perceived his Mother and Nurse made themselves be understood. We should then see the true Gradations by which Knowledge is acquired: We should judge, perhaps, what is in it self hard, and what easie, and also what it is that makes them so; and thereby

by make a better Estimate of the Force of Men's Understandings, than can now be made. But this Reminiscence of our first Idea's it is in vain to lament for, since it can never be had. Yet it may in general be observed, that the first Thoughts of Infants are concerning Things immediately necessary for Life. That Necessity being in some measure satisfied, they spend their Childhood in Pleasure, if left to their own liberty, till they are grown up. Then they begin to reflect upon the Things that relate to Prudence and Discretion, and that more or less, according as their Circumstances oblige them to carry themselves more or less warily towards those with whom they converse. This is, and ever was, general to all Mankind; whereas they would not take so much pains to cultivate the Arts of Luxury and Magnificence, if they were not spurr'd on by Pride, and a Desire of not being behind other Men. So that it is reasonable to suppose, that, all those Things which relate to Moral Knowledge, taken in its largest Extent, were understood by the ancient *Egyptians, Greeks and Romans*, in as great Perfection as the Things themselves were capable of. The Arts of Governing of Kingdoms and Families; of Managing the Affections and Fears of
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the unconstant Multitude; of Ruling their Passions, and Discourſing concerning their ſeveral Ways of Working; of Making prudent Laws, and Laying down wiſe Methods by which they might be the more eaſily and effectually obeyed; of Converſing each with other; of Giving and Paying all that Reſpect which is due to Men's ſeveral Qualities: In ſhort, all that is commonly meant by knowing the World, and underſtanding Mankind; all Things neceſſary to make Men Wiſe in Counſel, Dexterous in Buſineſs, and Agreeable in Converſation, ſeem to have been in former Ages thoroughly underſtood, and ſucceſſfully practiſed.

There is, indeed, great Reaſon to fear, that in the Arts of Knavery and Deceit, the preſent Age may have refined upon the foregoing; but that is ſo little for its Honour, that common Decency does almoſt as much oblige me to throw a Veil over this Reproach, as common Inter-eſt does all Mankind to put an effectual Stop to its Encreaſe. But ſince we are enquiring into Excellencies, not Blemiſhes and Imperfections, there ſeems to be great Reaſon to affirm, that After-Ages had no need to invent Rules, which already were laid down to their Hands; but that their Buſineſs was chiefly to re-examine

examine them, and to see which were proper for their Circumstances, considering what Alterations Time sensibly introduces into the Customs of every Age; and then to make a wise Choice of what they borrowed, that so their Judgment might not be question'd by those who should have the Curiosity to compare the Wisdom of several Ages together.

If we descend into Particulars, these Observations will, I believe, be found to be exactly true: The minutest Differences between Vertue and Vice of all sorts, are judiciously stated by *Aristotle*, in his *Ethicks to Nicomachus*; and the Workings of our Passions are very critically described in his Books of *Rhetorick*. *Xenophon's Cyrus* shews that he had a right Notion of all those Things which will make a Prince truly Great and Wise. The Characters of all those Vices which are immediately taken notice of in common Conversation, are admirably drawn by *Theophrastus*. Nothing can give a clearer Idea of one that has lived in Difficult Times, than the Writings of *Tacitus*; in whose Histories, almost every Thing is told in such a Way, as we find by our own Experience that Ill Usage and Disappointments lead Men to censure and report the Actions of their Governors. Great Skill
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in all the Arts and Secrets of Persuasion appear every where in *Demosthenes* and *Tully's* Orations, in *Quintilian's* Institutions, and the Orations in *Thucydides*, *Sallust* and *Livy*. The Duties of Mankind in Civil Life, are excellently set forth in *Tully's* Offices. Not one Passion of the Soul of Man has been untouch'd, and that with Life too, by some or other of the Ancient Poets. It would require a Volume to state these Things in their full Light; and it has been frequently done by those who have given Characters and Censures of Ancient Authors. So that one may justly conclude, that there is no one Part of Moral Knowledge, strictly so called, which was not known by the Ancients, so well as by the Moderns.

But it would be a wrong Inference to conclude from thence, that the Ancients were greater Genius's than the Men of the present Age. For, by Sir *William Temple's* Confession (b), the *Chineses* and *Peruvians* were governed by excellent Laws: And *Confucius* and *Mongo Capac* may well be reckoned amongst the Law-givers and Philosophers of those which are commonly called Learned Nations; though neither of them, especially the latter, can justly be suspected of learning what they knew

(b) Essay 3.
upon Heroick
Virtue, sect.
2, 3.

knew by Communication from their Neighbours. From whence Sir *William Temple* rightly concludes, that Common Sense is of the Growth of every Country; and that all People who unite into Societies, and form Governments, will in time make prudent Laws of all kinds; since it is not Strength of Imagination, nor Subtilty of Reasoning, but Constancy in making Observations upon the several Ways of Working of Humane Nature, that first stored the World with Moral Truths, and put Mankind upon forming such Rules of Practice as best suited with these Observations. There is no Wonder therefore, that in a long Series of Ages, which preceded *Socrates* and *Plato*, these Matters were carried to a great Perfection; for as the Necessity of any Thing is greater, so it will be more and more generally studied: And as the Subject of our Enquiries is nearer to us, or easier to be comprehended in it self; so it will be more thoroughly examined, and what is to be known, will be more perfectly understood. Both these concur here: Necessity of Conversing with each other, put Men upon making numerous Observations upon the Tempers of Mankind: And their own Nature being the Thing enquired after, all Men could make their Experiments at home;

home ; which, in Consort with those made with and by other People, enabled them to make certain Conclusions of Eternal Truth, since Mankind varies little, if any thing, any farther than as Customs alter it, from one Age to another. Since therefore this Necessity always lasts, and that all the Observations requisite to compleat this noble Science, as it takes in the Art of Governing Kingdoms, Families, and Men's private Persons, cannot be made by one or two Generations, there is a plain Reason why some Nations, which wanted Opportunities of diffused Conversation, were more barbarous than the rest ; and also, why others, which for many Ages met with no Foreign Enemies that could overturn their Constitutions, should be capable of improving this part of Knowledge as far as *unassisted Reason* was able to carry it.

For, after all, how weak the Knowledge of the ancient Heathens was, even here, will appear by comparing the Writings of the old Philosophers, with those Moral Rules which *Solomon* left us in the *Old Testament*, and which our Blessed Saviour and his Apostles laid down in the *New*: Rules so well suited to the Reason of Man, so well adapted to civilize the World, and to introduce that true Happiness

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pineness which the old Philosophers so vainly strove to find, that the more they are considered, the more they will be valued; and accordingly they have extorted even from those who did not believe the Christian Religion, just Applauses, which were certainly unbiassed, because, not being led by the Rewards which it proposes, nor deterred by the Punishments which it threatens, they could have no Motive to commend them but their own native Excellency.

It is evident therefore, that though in some sence the Moderns may be said to have learned their *Politics* and *Ethics* from the Ancients, yet there is no convincing Argument that can be brought from those Sciences, singly considered, that the Ancients had a greater Force of Genius than the wise and prudent Men of these later Generations. If, indeed, in all other Sciences, Mankind has for $\overline{\text{MD}}$ Years been at a full Stop, the Perfection of the Ancient *Politics* and *Ethics* may be justly urged, amongst other Arguments, for the comparative Strength of their Parts; otherwise not.

But there are other Parts of Learning, that may seem capable of farther Improvement; of which, the Advocates for the Ancients do not only pretend that they

they were the Inventors, but that their Performances have never since been equalled, much less out-done; though within these last $\overline{\text{CC}}$ Years all imaginable Pains have been taken to do it; and great Rewards have been given to those who have, *licet non passibus æquis*, laboured to come near the Copies which were already set them. From whence these Men think it probable, that all Modern Learning is but Imitation, and that faint and flat, like the Paintings of those who draw after Copies at a Third or Fourth Hand from the Life. Now, as this can only be known by an Induction of Particulars, so of these Particulars there are Two sorts: One, of those wherein the greatest part of those Learned Men who have compared Ancient and Modern Performances, either give up the Cause to the Ancients quite, or think, at least, that the Moderns have not gone beyond them. The other of those, where the Advocates for the Moderns think the Case so clear on their Side, that they wonder how any Man can dispute it with them. *Poesie, Oratory, Architecture, Painting, and Statuary*, are of the First Sort: *Natural History, Physiology, and Mathematics*, with all their Dependencies, are of the Second.

CHAP. III.

*Of Ancient and Modern Eloquence
and Poesie.*

IT is universally acknowledged, that he who has studied any Subject, is a better Judge of that Subject than another Man who did never purposely bend his Thoughts that way, provided they be both Men of equal Parts. Yet we see there are many Things, whereof Men will, at first sight, pass their Judgment, and obstinately adhere to it, though they not only know nothing of those Matters, but will confess that it requires Parts, and Skill, and Exercise, to be excellent in them. This is remarkably visible in the Censures which are passed upon Pieces of *Oratory* and *Poesie* every Day by those who have but little of that sort of Learning themselves; and to whom all that is said of critical Skill in those Things, and of a true Relish of what is really fine, is Jargon and Cant. And in the mean time, these Men do in other Things shew great Accuracy and Judgment, even in Subjects which require quick Apprehension, nice Observation, and

and frequent Meditation. If one should ask why such Men so frequently mistake and differ in those other Matters, the Answer, I think, is this : (1.) The Foundations of Eloquence of all sorts lying in Common Sense, of which every Man is in some degree a Master, most ingenious Men have, without any Study, a little Insight into these Things. This little Insight betrays them immediately to declare their Opinions, because they are afraid, if they should not, their Reputation would be in danger. On the contrary, where the Subject is such, that every Man finds he can frame no *Idea* of it in his own Mind, without a great number of Premises, which cannot be attained by common Conversation, all wise Men hold their Tongues, suspect their own Abilities, and are afraid that they cannot fathom the Depth of his Knowledge with whom they converse ; especially if he has a Name for Skill in those Matters. And therefore, talk with such Men of a Law-Case, or a Problem in Geometry, if they never studied those Things, they will frankly tell you so, and decline to give their Opinion. Whereas if you speak to them of a Poem, a Play, or a Moral Discourse upon a Subject capable of Rhetorical Ornaments, they will immediately

pass their Censure, right or wrong; and Twenty Men, perhaps, shall give Twenty different Opinions; whilst, in the other Cases, scarce Two of the Twenty shall disagree, if they are conscious to themselves that they have Skill enough to judge without another's help. (2.) In most of these Things our Passions are some way or other concerned; at least, being accustomed to have them moved, we expect it, and think our selves disappointed when our Expectation is deceived. Now, when a Man is to judge in Matters of this kind, he generally before-hand is pre-possessed with such Passions as he would willingly have raised, or confirmed; and so speaks as his Expectation is answered. But when our Passions do not move in these Matters, as they seldom do upon Subjects a great way off, then our Censures are more unanimous. For, as the Poet says,

*Securus licet Æneam Rutulumque ferocem
Committas; nulli gravis est percussus A-
chilles.*

So that there is no great Wonder why Men should receive the Writings of the Ancients with so great Respect: For the Distance of Time takes off Envy; and the
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being accustomed from our Childhood to hear them commended, creates a Reverence. Yet though due Allowances ought to be made for these Pre-possessions, one has Reason to believe, that this Reverence for the ancient Orators and Poets is more than Prejudice. (By Orators, I understand all those Writers in Prose who have taken pains to beautify and adorn their Style.) Their Works give us a very solid Pleasure when we read them. The best in their kind among the Moderns have been those who have read the Ancients with greatest Care, and endeavoured to imitate them with the greatest Accuracy. The Masters of Writing in all these several Ways, to this Day, appeal to the Ancients, as their Guides; and still fetch Rules from them, for the Art of Writing. *Homer*, and *Aristotle*, and *Terence*, and *Virgil*, and *Horace*, and *Ovid*, are now studied as Teachers, not barely out of Curiosity, by Modern Poets. So likewise are *Demosthenes*, *Aristotle*, *Tully*, *Quintilian*, and *Longinus*, by those who would write finely in Prose. There is reason therefore to think that in these Arts the Ancients may have out-done the Moderns; though neither have they been neglected in these later Ages, in which we have seen extraordinary Productions,

which the Ancients themselves, had they been alive, would not have been ashamed of.

If this be so, as I verily believe it is, sure now (it will be objected) It is evident that the Ancients had a greater Force of Genius than the Moderns can pretend to. Will it be urged, that here also they had an Advantage by being born first? Have these Arts a fixed Foundation in Nature; or were they not attained to by Study? If they come by Nature, why have we heard of no Orators among the Inhabitants of the Bay of *Soldania*, or eminent Poets in *Peru*? If they are got by Study, why not now, as well as formerly, since Printing has made Learning cheap and easie? Can it be thought harder to Speak and Write like *Cicero* or *Virgil*, than to find out the Motions of the Heavens, and to calculate the Distances of the Stars? What can be the Reason of this Disparity?

The Reasons are several, and scarce one of them of such a Nature as can now be helped, and yet not conclusive against the Comparative Strength of Understanding, evidently discernible in the Productions of the Learned Men of the present, and immediately foregoing Ages; to which I would here be understood strictly

strictly to confine my Notion of the word *Modern*. These Reasons I shall examine at large, because, if they are valid, they quite take away the Force of Sir *William Temple's* Hypothesis; and by removing the blind Admiration now paid to the Ancient Orators and Poets, set it upon such a Foot as will render the Reading of their Books more useful, because less superstitious. They are of several sorts; some relating to *Oratory*, some to *Poesie*, and some in common to both.

I shall first speak of those which relate more particularly to *Poetry*, because it was much the ancientest way of Writing in *Greece*; where their Orators owned, that they learned a great deal of what they knew, even in their own, as well as in other Parts of Learning, from their Poets. And here one may observe, that no Poetry can be Charming that has not a Language to support it. The *Greek* Tongue has a vast Variety of long Words, wherein long and short Syllables are agreeably intermixed together, with great Numbers of Vowels and Diphthongs in the Middle-Syllables, and those very seldom clogged by the joining of harsh-sounding Consonants in the same Syllable: All which Things give it a great Advantage above any other Language that
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has ever yet been cultivated by Learned Men. By this Means all manner of Tunable Numbers may be formed in it with Ease ; as still appears in the remaining *Dramatic* and *Lyric* Composures of the *Greek* Poets. This seems to have been at first a lucky Accident, since it is as visible in *Homer*, who liv'd before the Grammarians had determined the Analogy of that Language by Rules ; which Rules were, in a very great measure, taken from his Poems, as the Standard ; as in those Poets that came after him. And that this peculiar Smoothness of the *Greek* Language was at first Accidental, farther appears, because the *Phœnician* or *Hebrew* Tongue, from whence it was formed, as most Learned Men agree, is a rough, unpolished Tongue, abounding with short Words, and harsh Consonants : So that if one allows for some small Agreement in the Numbers of Nouns, and Variations of Tenses in Verbs, the two Languages are wholly of a different Make. That a derived Language should be sweeter than its Mother-Tongue, will seem strange to none that compares the Modern *Tuscan* with the Ancient *Latin* ; where, though their Affinity is visible at first sight, in every Sentence, yet one sees that that derived Language actually has a Sweetness and

and Tunableness in its Composition, that could not be derived from its Parent; since nothing can impart that to another, which it has not it self: And it shews likewise, that a Barbarous People, as the *Italians* were when mingled with the *Goths* and *Lombards*, may, without knowing or minding Grammatical Analogy, form a Language so exceedingly Musical, that scarce any Art can mend it. For, in *Boccace's* Time, who liv'd above CCC Years ago, in the earliest Dawnings of Polite Learning in these Western Parts of the World, *Italian* was a formed Language, endued with that peculiar Smoothness which other *Europæan* Languages wanted; and it has since suffered no fundamental Alterations; not any, one should think, for the better, since in the *Dictionary* of the Academy *della Crusca*, *Boccace's* Writings are constantly appealed to, as the Standards of the Tongue. Nay, it is still disputed among the Criticks of the *Italian Language*, whether (c) *Dante*, (c) See *Boccace*, *Petrarch*, and *Villani*, who were *li Pensieri diversi di Tassoni*, all Contemporaries, are not the Valuablest lib. ix. as well as the Ancientest Authors they cap. 15. have.

Now, when this Native Smoothness of the *Greek Tongue* was once discovered to common Ears, by the sweetness of their Verses, which depended upon a Regular Compo-

Composition of Long and Short Syllables, all Men paid great Respect to their Poets, who gave them so delightful an Entertainment. The wiser Sort took this Opportunity of Civilizing the rest, by putting all their Theological and Philosophical Instructions into Verse; which being learn'd with Pleasure, and remembred with Ease, help'd to heighten and preserve the Veneration already, upon other Scores, paid to their Poets. This encreased the Number of Rivals, and every one striving to out-doe his Neighbour; some by varying their Numbers, others by chusing Subjects likely to please, here and there some, one or two at least of a sort, proved excellent: And then those who were the most extraordinary in their several Ways, were esteemed as Standards by succeeding Ages; and Rules were framed by their Works, to examine other Poems of the same sort. Thus *Aristotle* framed Rules of *Epic* Poesie from *Homer*: Thus *Aristophanes*, *Menander*, *Sophocles* and *Euripides* were looked upon as Masters in *Dramatic* Poesie; and their Practice was sufficient Authority. Thus *Mimnermus*, *Philetas* and *Callimachus* were the Patterns to following Imitators for *Elegy* and *Epigram*. Now, Poetry being a limited Art, and these Men, after the often-repeated Trials of others, had proved successless;

successless; finding the true Secret of pleasing their Country-men, partly by their Wit and Sence, and partly by the inimitable Sweetness of their Numbers, there is no wonder that their Successors, who were to write to a pre-possessed Audience, though otherwise Men of equal, perhaps greater Parts, failed of that Applause of which the great Masters were already in possession; for Copying nauseates more in Poetry, than any thing: So that *Sannazarius* and *Buchanan*, tho' admirable Poets, are not read with that Pleasure which Men find in *Lucretius* and *Virgil*, by any but their Country-men; because they wrote in a dead Language, and so were frequently obliged to use the same Turns of Thought, and always the same Words and Phrases, in the same Sence in which they were used before by the Original Authors; which forces their Readers too often to look back upon their Masters; and so abates of that Pleasure which Men take in *Milton*, *Cowley*, *Butler*, or *Dryden*, who wrote in their Mother-Tongue, and so were able to give that unconstrained Range and Turn to their Thoughts and Expressions that are truly necessary to make a compleat Poem.

It may therefore be reasonably believed, that the natural Softness, Expressiveness and Fulness of the *Greek Language* gave great

great Encouragement to the *Greek* Poets to labour hard, when they had such manageable Matter to work upon, and when such Rewards constantly attended their Labours. This likewise was a great help to their Orators, as well as their Poets; who soon found the Beauties of a numerous Composition, and left nothing undone, that could bring it to its utmost Perfection. But this was not so important a Consideration, as alone to have encouraged the *Greeks* to cultivate their Eloquence, if the Constitution of their Governments had not made it necessary; and that Necessity had not obliged great Numbers of ingenious Men to take Pains about it.

Most part of *Greece*, properly so called, and of *Asia the Less*, the Coasts of *Thrace*, *Sicily*, the Islands in the *Mediterranean*, and a great part of *Italy*, were long divided into a very many Kingdoms and Commonwealths; and many of these small Kingdoms, taking Example by their Neighbouring Cities that had thrown off their imperious Masters, turned, in time, to Commonwealths, as well as they. These, as all little Governments that are contiguous, being well nigh an even Match for each other, continued for many Ages in that Condition. Many of the chiefest were Democracies; as, the Republics of *Athens*,
Syracuse,

Syracuse, Thebes and Corinth; where it was necessary to complement the People upon all Occasions: So that busie, factious Men had Opportunities enough to shew their Skill in Politics. Men of all Tempers, and all Designs, that would accuse or defend, that would advise or consult, were obliged to address themselves in set Harangues to the People. Interest therefore, and Vanity, Motives sometimes equally powerful, made the Study of Rhetoric necessary; and whilst every Man followed the several Biass of his own Genius, some few found out the true Secret of Pleasing, in all the several Ways of Speaking well, which are so admirably and so largely discoursed of by the ancient Rhetoricians. *Demosthenes* being esteem'd beyond all his Predecessors, for the Correctness of his Stile, the Justness of his Figures, the Easiness of his Narrations, and the Force of his Thoughts; his Oration were look'd upon as Standards of Eloquence by his Country-men: Which Notion of theirs effectually dampt future Endeavours of other Men, since here, as well as in Poetry and Painting, all Copiers will ever continue on this side of their Originals. And besides, the great End of Oratory being to persuade, wherein Regard must be had to the Audience, as well

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as to the Subject, if there be but one Way of doing best at the same time in both, as there can be but one in all limited Arts or Sciences, they that either first find it out, or come the nearest to it, will unquestionably, and of Right, keep the first Station in Men's Esteem, though perhaps they dare not, for fear of disgusting the Age they live in, follow those Methods which they admire so much, and so justly, in those great Masters that went before them.

That these Accidents, and not a particular Force of Genius, raised the *Græcian* Poësie and Oratory, will farther appear, if we reflect upon the History of the Rise and Encrease of both those Arts amongst the *Romans*: Their Learning, as well as their Language, came originally from *Greece*; they saw what was done to their Hands, and *Greek* was a living Language; and so, by the help of Masters, they could judge of all its Beauties. Yet, with all their Care, and Skill, and Pains, they could not, of a long time, bring their Poetry to any Smoothness; they found their Language was not so ductile, they owned it, and complained of it. It had a Majestick Gravity, derived from the People themselves who spoke it; which made it proper for Philosophical and Epical Poems;

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for which Reason, *Lucretius* and *Virgil* were able to do so great Things in their several Ways, their Language enabling them to give the most becoming Beauties to all their Thoughts. But there not being that Variety of Feet in the *Latin*, which Language, for the most part, abounds in *Dactyles*, *Spondees* and *Trochees*; nor that Sprightliness of Temper, and in-bred Gaiety in the *Romans*, which the *Greeks* are to this Day famous for, even to a Proverb, in many parts of Poetry they yielded, though not without Reluctancy, to a People whom they themselves had conquered. Which shews, that there are some Imperfections which cannot be overcome: And when these Imperfections are accidental, as the Language is which every Man speaks at first, though he has equal Parts, and perhaps greater Industry, yet he shall be thrown behind another Man who does not labour under those Inconveniences; and the Distance between them will be greater, or less, according to the Greatness or Quality of these Inconveniences.

If we look into the chiefest Modern Languages, we shall find them labouring under much greater: For, the Quantities of Syllables being in a great measure neglected in all Modern Languages, we can-

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not make use of that Variety of Feet which was anciently used by the *Greeks* and *Romans*, in Modern Poems. The Guide of Verses is not now Length of Syllable, but only Number of Feet, and Accent. Most of the *French* Accents are in the last Syllable; Ours, and the *Italian*, in the fore-going. This fits *French* for some sorts of Poems, which *Italian* and *English* are not so proper for. Again, All Syllables, except the Accented one in each Word, being now common in Modern Languages, we Northern People often make a Syllable short that has two or three Consonants in it, because we abound in Consonants: This makes *English* more unfit for some Poems, than *French* and *Italian*; which having fewer Consonants, have consequently a greater Smoothness and Flowingness of Feet, and Rapidity of Pronunciation.

I have brought these Instances out of Modern Languages, whereof Sir *William Temple* is so great a Master, to prove my first Assertion; namely, That though a very great deal is to be given to the Genius and Judgment of the Poet, which are both absolutely necessary to make a good Poem, what Tongue soever the Poet writes in; yet the Language it self has so great an Influence, that if *Homer* and
Virgil

Virgil had been *Polanders*, or *High-Dutchmen*, they would never, in all probability, have thought it worth their while to attempt the Writing of Heroick Poems; *Virgil* especially, (d) who began to write an Historical Poem of some great Actions of his Country-men; but was so gravell'd with the Roughness of the *Roman* Names, that he laid it aside.

(d) Cum res Romanas
inchoasset, offensus mate-
ria & nominum asperi-
tate, ad Bucolica transiit.
Donatus in Vit. Virgilii.

Now, as the *Roman* Poetry arrived to that Perfection which it had, because it was supported by a Language, which, tho' in some Things inferiour to the *Greek*, had several noble and charming Beauties, not now to be found in Modern Languages; so the *Roman* Oratory was owing to their Government: Which makes the Parallel much more perfect: And all those Reasons alledged already for the Growth of the *Attic* Eloquence, are equally applicable to the History of the *Roman*; so that there is no necessity of Repeating them. To which we may add, That when the *Romans* once lost their Liberty, their Eloquence soon fell: And *Tacitus* (or *Quintilian*) needed not have gone so far about to search for Reasons of the Decay of the *Roman* Eloquence. *Tully* left his Country and Profession, after his Defence of *S. Roscius Amerinus*; resolving to give over Pleading,

if *Sylla's* Death had not restored that Freedom which only gave Life to his Oratory: And when the Civil Wars between *Pompey* and *Cæsar* came on, he retired, because his Profession was superseded by a rougher Rhetoric, which commands an Attentive Audience in all Countries where it pleads.

When Orators are no longer Constituent Parts of a Government, or, at least, when Eloquence is not an almost certain Step to arrive at the chiefest Honours in a State, the Necessity of the Art of Speaking, is, in a great measure, taken off; and as the Authority of Orators lessens, which it will insensibly do, as Tyranny and Absolute Power prevail, their Art will dwindle into Declamation, and an Affectation of Sentences, and Forms of Wit. The Old Men, who out-live their former Splendour, will, perhaps, set their own Scholars and Auditors right, and give them a true Relish of what is Great and Noble; but that will hardly continue above one or two Generations. Which may be super-added as another Reason why there were no more *Demosthenes's* or *Tully's*, after the *Macedonian* and *Roman* Emperors had taken away the Liberty of the *Græcian* and *Roman* Commonwealths. It is Liberty alone which inspires Men with Lofty Thoughts,

Thoughts, and elevates their Souls to a higher Pitch than Rules of Art can direct. Books of Rhetoric may make Men Copious and Methodical; but they alone can never infuse that true Enthusiastic Rage which Liberty breaths into their Souls who enjoy it; and which, guided by a Sedate Judgment, will carry Men farther than the greatest Industry, and the quickest Parts can go without it.

When Private Members of a Commonwealth can have Foreign Princes for their Clients, and plead their Causes before their Fellow-Citizens; when Men have their Understandings enlarged, by a long Use of public Business, for many Years before they speak in publick; and when they know that their Auditory are Men, not only of equal Parts, and Experience in Business; but also many of them Men of equal, if not greater Skill in Rhetoric than themselves: Which was the Case of the Old *Romans*. These Men, inflamed with the mighty Honour of being Patrons to Crowned Heads, having Liberty to speak any Thing that may advantage their Cause, and being obliged to take so great Pains to get up to, or to keep above so many Rivals, must needs be much more excellent Orators, than other Ages, destitute of such concurrent Circumstances;

though every thing else be equal, can possibly produce.

Besides all this, the Humour of the Age in which we live is exceedingly altered; Men apprehend or suspect a Trick in every Thing that is said to move the Passions of the Auditory in *Courts of Judicature*, or in the *Parliament-House*: They think themselves affronted when such Methods are used in Speaking, as if the Orator could suppose within himself, that they were to be caught by such Baits. And therefore, when Men have spoken to the Point, in as few Words as the Matter will bear, it is expected they should hold their Tongues. Even in the Pulpit, the Pomp of Rhetoric is not always commended, especially here in *England*; and very few meet with Applause, who do not confine themselves to speak with the Severity of a Philosopher, as well as with the Splendour of an Orator; two Things, not always consistent. What a Difference in the Way of Thinking must this needs create in the World? Anciently, Orators made their Employment the Work of their whole Lives; and as such, they followed it: All their Studies, even in other Things, were, by a sort of Alchemy, turned into Eloquence. The Labour which they thought requisite, is evident to any Man that

that reads *Quintilian's Institutions*, and the Rhetorical Tracts of *Cicero*. This exceedingly takes off the Wonder : Eloquence may lie in common for Ancients and Moderns ; yet those only shall be most Excellent that cultivate it most, and give it the greatest Encouragement, who live in an Age that is accustomed to, and will bear nothing but Masculine, unaffected Sense ; which likewise must be cloathed with the most splendid Ornaments of Rhetoric.

Sir *William Temple* will certainly agree with me in this Conclusion, That former Ages produced greater *Orators*, and nobler *Poets*, than these later ones have done ; though perhaps he may disagree with me about the Way by which I came to my Conclusion ; since hence it will follow, that the present Age, with the same Advantages, under the same Circumstances, might produce a *Demosthenes*, a *Cicero*, a *Horace*, or a *Virgil* ; which, for any thing hitherto said to the contrary, seems to be very probable.

But, though the Art of Speaking, assisted by all these Advantages, seems to have been at a greater height amongst the *Greeks* and *Romans*, than it is at present ; yet it will not follow from thence, that every Thing which is capable of Rhetorical

rical Ornaments, should, for that sole Reason, be more perfect anciently than now; especially if these be only Secondary Beauties, without which, that Discourse wherein they are found may be justly valuable, and that in a very high Degree. So that, though, for the purpose, one should allow the Ancient Historians to be better Orators than the Modern; yet these last may, for all that, be much better, at least, equally good Historians; those among them especially, who have taken fitting Care to please the Ears, as well as instruct the Understandings of their Readers. Of all the Ancient Historians before *Polybius*, none seems to have had a right Notion of writing History, except *Thucydides*: And therefore *Polybius*, whose first Aim was, to instruct his Reader, by leading him into every Place whither the Thread of his Narrative carried him, makes frequent Excuses for those Digressions, which were but just necessary to beget a thorough Understanding of the Matter of Fact of which he was then giving an Account. These Excuses shew that he took a new Method; and they answer an Objection, which might otherwise have been raised from the small Numbers of extant Histories that were written before his Time; as if we could make no Judgment of those that
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are lost, from those that are preserved. For, the Generality of those who wrote before him, made Rhetoric their chief Aim; and therefore all Niceties of Time, and Place, and Person, that might hurt the Flowingness of their Stile, were omitted; instead whereof, the Great Men of their *Drama's*, were introduced, making long Speeches; and such a Gloss was put upon every Thing that was told, as made it appear extraordinary; and whatsoever was wonderful and prodigious, was mentioned with a particular Emphasis.

This Censure will not appear unjust to any Man who has read Ancient Historians with ordinary Care; *Polybius* especially: Who, first of all the Ancient Historians, fixes the Time of every great Action that he mentions: Who assigns such Reasons for all Events, as seem, even at this distance, neither too great, nor too little: Who, in Military Matters, takes Care, not only to shew his own Skill, but to make his Reader a Judge, as well as himself: Who, in Civil Affairs, makes his Judgment of the Conduct of every People from the several Constitutions of their respective Governments, or from the Characters and Circumstances of the Actors themselves: And last of all, Who scrupulously avoids saying any Thing that might appear incredible

credible to Posterity ; but represents Things in such a manner, as a wise Man may believe they were transacted : And yet he has neglected all that Artful Eloquence which was before so much in fashion.

If these therefore be the chiefest Perfections of a just History, and if they can only be the Effects of a great Genius, and great Study, or both ; at least, not of the last, without the first, we are next to enquire whether any of the Moderns have been able to attain to them : And then, if several may be found, which in none of these Excellencies seem to yield to the noblest of all the Ancient Historians, it will not be difficult to give an Answer to Sir William Temple's Question ;

(e) Pag. 57. *Whether (e) D'Avila's and Strada's Histories be beyond those of Herodotus and Livy ?* I shall name but two ; *The Memoirs of Philip Comines, and F. Paul's History of the Council of Trent.*

Philip Comines ought here to be mention'd, for many Reasons : For, besides that he particularly excels in those very Vertues which are so remarkable in *Polybius*, to whom *Lipshius* makes no scruple to compare him, he had nothing to help him but Strength of Genius, assisted by Observation and Experience : He owns himself, that he had no Learning ; and indeed,

indeed, the thing it self is evident to any Man that reads his Writings. He flourished in a barbarous Age, and died just as Learning had crossed the *Alpes*, to get into *France*: So that he could not, by Conversation with Scholars, have those Defects which Learning cures, supplied. This is what cannot be said of the *Thucydides's*, *Polybius's*, *Sallusts*, *Livies*, and *Tacitus's* of Antiquity. Yet, with all these Disadvantages, (to which this great one ought also to be added, That by the Monkish Books then in vogue, he might sooner be led out of the Way, than if he had none at all to peruse,) his Style is Masculine and significant; though diffuse, yet not tedious; even his Repetitions, which are not over-frequent, are diverting: His Digressions are wise, proper, and instructing: One sees a profound Knowledge of Mankind in every Observation that he makes; and that without Ill Nature, Pride, or Passion. Not to mention that peculiar Air of Impartiality, which runs through the whole Work; so that it is not easie to withdraw our Assent from every thing which he says. To all which I need not add, that his History never tires, though immediately read after *Livy* or *Tacitus*.

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In *F. Paul's* History one may also find the Excellencies before observed in *Polybius*; and it has been nicely examined by dexterous and skilful Adversaries, who have taken the Pains to weigh every Period, and rectifie every Date. So that, besides the Satisfaction which any other admirable History would have afforded us, we have the Pleasure of thinking that we may safely rely upon his Accounts of Things, without being mis-guided in any one leading Particular of great moment, since Adversaries, who had no Inclination to spare him, could not invalidate the Authority of a Book which they had so great a desire to lessen. I should have taken notice of no Modern Historians besides *D'Avila* and *Strada*, if there were as much Reason to believe their Narratives, as there is to commend their Skill in Writing. *D'Avila* must be acknowledged to be a most Entertaining Historian; one that wants neither Art, Genius, nor Eloquence, to render his History acceptable. *Strada* imitates the old *Romans*, so happily, that those who can relish their Eloquence, will be always pleased with his.

Upon the whole Matter, one may positively say, That where any Thing in which Oratory can only claim a Share,
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has been equally cultivated by the Moderns, as by the Ancients; they have equalled them at least, if not out-done them, setting aside any particular Graces, which might as well be owing to the Languages in which they wrote, as to the Writers themselves.

CHAP. IV.

Reflections upon Monsieur Perrault's Hypothesis, That Modern Orators and Poets are more Excellent than Ancient.

WHatever becomes of the Reasons given in the last Chapter, for the Excellency of Ancient Eloquence and Poetry, the Position it self is so generally held, that I do not fear any Opposition here at home. It is almost an Heresie in Wit, among our Poets, to set up any Modern Name against *Homer* or *Virgil*, *Horace* or *Terence*. So that though here and there one should in Discourse prefer the Writers of the present Age, yet scarce any Man among us, who sets a Value upon his own Reputation, will venture
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to assert it in Print. Whether this is to be attributed to their Judgment or Modesty, or both, I will not determine; though I am apt to believe, to both, because in our Neighbour-Nation, (some of whose Writers are remarkable for a good deal of what Sir *William Temple* calls *Sufficiency*,) some late Authors have spoken much more openly.

For one of the Members of the *French Academy*, which, since the Cardinal *de Richelieu's* time, has taken so much Pains to make the *French Language* capable of all those Beauties which are so conspicuous in Ancient Authors, will not allow me to go so far as I have done. Monsieur *Perrault*, the famous Advocate of Modern Orators and Poets, in Oratory sets the Bishop of *Meaux* against *Pericles*, (or rather, *Thucydides*,) the Bishop of *Nismes* against *Isocrates*, F. *Bourdalone* against *Lyfias*, Monsieur *Voiture* against *Pliny*, and Monsieur *Balzac* against *Cicero*. In Poetry likewise he sets Monsieur *Boileau* against *Horace*, Monsieur *Corneille* and Monsieur *Moliere* against the Ancient Dramatic Poets. In short, though he owns that some amongst the Ancients had very exalted Genius's, so that it may, perhaps, be very hard to find any Thing that comes near the Force of some of the
Ancient

Ancient Pieces, in either kind, amongst our Modern Writers ; yet he affirms, that Poetry and Oratory are now at a greater height than ever they were, because there have been many Rules found out since *Virgil's* and *Horace's* Time ; and the old Rules likewise have been more carefully scanned than ever they were before. This Hypothesis ought a little to be enquired into, and therefore I shall offer some few Considerations about this Notion. Sir *William Temple*, I am sure, will not think this a Digression ; because the Author of the Plurality of Worlds, (f) by censuring of the Old Poetry, and (f) Pag. 5: giving Preference to the New, raised his Indignation ; which no Quality among Men was so apt to raise in him as Sufficiency, the worst Composition out of the Pride and Ignorance of Mankind.

(1.) Monsieur *Perrault* takes it for granted, that *Cicero* was a better Orator than *Demosthenes* ; because, living after him, the World had gone on for above Two Hundred Years, constantly improving, and adding new Observations, necessary to compleat his Art : And so by Consequence, that the Gentlemen of the Academy must out-doe *Tully*, for the same Reasons. This Proposition, which is the Foundation of a great part of his Book, is

is not very easie to be proved ; because Mankind loves Variety in those Things wherein it may be had so much, that the best Things, constantly re-iterated, will certainly disgust. Sometimes the Age will not bear Subjects, upon which an Orator may display his full Force ; he may often be obliged to little, mean Exercises. A Thousand Accidents, not discoverable at a distance, may force Men to stretch their Inventions to spoil that Eloquence, which left to it self, would do admirable Things. And that there is such a Thing as a Decay of Eloquence in After-Ages, which have the Performances of those that went before constantly to recurr to, and which may be supposed to pretend to Skill and Fineness, is evident from the Writings of *Seneca*, and the Younger *Pliny*, compared with *Tully's* ; And from a Discourse written in *Tacitus's* Time, upon this very Subject, wherein the Author, taking it for granted that the *Roman* Eloquence was sunk, enquires, with a World of Wit and Spirit, into the Reasons of its Decay. One great Instance which *Monsieur Per- rault* alledges of his supposed want of Art in the Ancients, is want of Method in setting down their Thoughts, even when one would think they should have taken the greatest Care. This Accusation is, in
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my Opinion, very groundless. Let *Tully's Pleadings* and *Quintilian's Institutions* be examined, and then let the Controversie be decided by that Examination. And if Panegyricks and Funeral-Orations do not seem so regular, it is not because Method was little understood, but because in those Discourses it was not so necessary. Where Men were to reason severely, Method was strictly observed : And the Vertues discoursed upon in *Tully's Offices* are as judiciously and clearly digested under their proper Heads, as the Subject-Matter of most Discourses written by any Modern Author, upon any Subject whatsoever. It does not seem possible to contrive any Poem, whose Parts can have a truer, or more artful Connexion, than *Virgil's Æneis* : And though it is now objected by *Monsieur Perrault*, as a Fault, that he did not carry on his Poem to the Marriage of *Æneas* and *Lavinia*, yet we may reasonably think, that he had very good Reasons for doing so ; because in *Augustus's* Court, where those sort of Things were very well understood, it was received with as great Veneration as it has been since ; and never needed the Recommendation of Antiquity, to add to its Authority. But we need not recurr to an Excuse, or to any thing that may look like one, in
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this Matter: It is a Fault in Heroic Poetry, to fetch Things from their first Originals: And to carry the Thread of the Narrative down to the last Event, is altogether as dull. As *Homer* begins not with the Rape of *Helen*, so he does not go so far as the Destruction of *Troy*. Men should rise from Table with some Appetite remaining: And a Poem should leave some View of something to follow, and not quite shut the Scenes; especially if the remaining part of the Story be not capable of much Ornament, nor will admit of Variety. The Passion of Love, with those that always follow upon its being disappointed, had been shewn already in the Story of *Dido*. But Monsieur *Perrault* seems to have had his Head possessed with the Idea of French Romances; which, to be sure, must never fail to end in a general Wedding.

(2.) Another of Monsieur *Perrault*'s Arguments, to prove that the Ancients did not perfect their Oratory and Poësie, is this; That the Mind of Man, being an inexhaustible Fund of new Thoughts and Projects, every Age added Observations of its own to the former Store; so that they still encreased in Politeness, and by consequence, their Eloquence of all sorts, in Verse or Prose, must needs have been
more

more exact. And as a Proof of this Assertion, he instances in Matters of Love; wherein the Writings of the best bred Gentlemen of all Antiquity, for want of Modern Gallantry, of which they had no Notion, were rude and unpolish'd, if compar'd with the Poems and Romances of the present Age. Here Monsieur *Perault's* Skill in Architecture seems to have deceiv'd him: For there is a wide Difference between an Art that, having no Antecedent Foundation in Nature, owes its first Original to some particular Invention, and all its future Improvements to Superstructures rais'd by other Men upon that first Ground-work; and between such Operations of the Mind, as are Congenial with our Natures; where Conversation will polish them, even without previous Intentions of doing so; and where the Experience of a few Ages, if assist'd by Books that may preserve particular Cases, will carry them to as great an Height as the Things themselves are capable of. And therefore, he that now examines the Writings of the Ancient Moral Philosophers, *Aristotle* for instance, or the *Stoics*, will find, that they made as nice Distinctions in all Matters relating to Virtue and Vice; and that they understood Humane Nature, with all its Passions and

Appetites, as accurately as any Philosophers have done since. Besides, it may be justly question'd, whether what Monsieur *Perrault* calls *Politeness*, be not very often rather a vicious Aberration from, and Straining of Nature, than an Improvement of the Manners of the Age: If so, it may reasonably be supposed, that those that medled not with the Niceties of Ceremony and Breeding, before unpractised, rather contemned them as improper or unnatural, than omitted them through Ignorance occasioned by the Roughness of the Manners of the Ages in which they lived. *Ovid* and *Tibullus* knew what Love was, in its tenderest Motions; they describe its Anxieties and Disappointments in a manner that raises too too many Passions, even in unconcerned Hearts; they omit no probable Arts of Courtship and Address; and keeping the Mark they aim at still in view, they rather chuse to shew their Passion, than their Wit: And therefore they are not so formal as the Heroes in *Pharamond* or *Cassandra*; who, by pretending to Exactness in all their Methods, commit greater Improbabilities than *Amadis de Gaule* himself. In short, (g) *D'Urfe*, and (h) *Calprenede*, and the rest of the French Romancers, by over-straining the String, have

(g) The
Author of
Astrea.

(h) The
Author of
Cleopatra.

have broke it : And one can as soon believe that *Varillas* and *Maimbourg* wrote the Histories of great Actions just as they were done, as that Men ever made Love in such a way as these *Love-and-Honour Men* describe. That Simplicity therefore of the Ancients, which Monsieur *Perrault* undervalues, is so far from being a Mark of Rudeness, and Want of Complaisance, that their Fault lay in being too Natural, in making too lively Descriptions of Things, where Men want no Foreign Assistance to help them to form their *Idea's* ; and where Ignorance, could it be had, is more valuable than any, much more than a Critical Knowledge. But,

(3.) Since,

*By that loud Trumpet which our Courage
aids,*

*We learn, that Sound, as well as Sense,
persuades ;*

the Felicity of a manageable Language, when improv'd by Men of nice Ears, and true Judgments, is greater, and goes farther to make Men Orators and Poets, than Monsieur *Perrault* seems willing to allow ; though there is a plain Reason for his Unwillingness : The *French* Language wants Strength to temper and sup-

port its Smoothness for the nobler Parts of Poëse, and perhaps of Oratory too, though the *French* Nation wants no Accomplishments necessary to make a Poet, or an Orator. Therefore their late Critics are always setting Rules, and telling Men what must be done, and what omitted, if they would be Poets. What they find they cannot do themselves, shall be so clogg'd where they may have the Management, that others shall be afraid to attempt it. They are too fond of their Language, to acknowledge where the Fault lies; and therefore the chief Thing, they tell us, is, that Sence, Connexion and Method are the principal Things to be minded. Accordingly, they have translated most of the Ancient Poets, even the *Epyics*, into *French* Prose; and from those Translations they pass their Judgments, and call upon others to do so too. So that when (to use Sir J. Denham's Comparison) by pouring the Spirits of the Ancient Poetry from one Bottle into another, they have lost the most Volatile Parts, and the rest loses all its relish; these Critics exclaim against the Ancients, as if they did not sufficiently understand Poetical Chymistry. This is so great a Truth, that even in Oratory it holds, though in a less degree. *Thucydides* therefore has
hard

hard Measure, to be compar'd with the Bishop of *Méaux*, when his Orations are turned into another Language, whilst Monsieur de *Méaux*'s stands unaltered; for, though Sense is Sense in every Tongue, yet all Languages have a peculiar Way of expressing the same Things; which is lost in Translations, and much more in Monsieur *D'Ablancourt*'s, who professed to mind two very different Things at once; to Translate his Author, and to Write elegant Books in his own Language; which last he has certainly done; and he knew that more Persons could find fault with his Style, if it had been faulty, than find out Mistakes in his Rendering of *Thucydides*'s Greek. Besides, the Beauty of an Author's Composition, is, in all Translations, entirely lost; about which the Ancients were superstitiously exact, (i) and in their elegant Prose, as much almost as in their Verse. So that a Man can have but half an *Idea* of the ancient Eloquence, and that not always faithful, who judges of it without such a Skill in *Greek* and *Latin* as can enable him to read Histories, Orations and Poems in those Languages, with Ease and Pleasure; Especially if he is not so well acquainted with the History, Learning and Customs of the Ages in which the great Men of Antiquity wrote, as to

(i) Vid.
*Quintil.
Inst. Orat.
lib. ix. c. 4.
de Compositione.*

be able to discern the Force of the Allusions which they continually make, and which every Reader of their own Age easily understood, though their Beauty was soon lost, when once the Matters of Fact there tacitly referred to, were forgotten.

But these are Qualifications which Monsieur Perrault extremely wants, who has neither Greek nor Latin enough to undertake to make a Parallel between Ancient and Modern Orators and Poets. A particular Enquiry into whose Mistakes would lead me too far out of the way; and besides, the World would think me very vain, to attempt any thing of this kind, after what the Famous Monsieur Despreaux has done already in his *Critical Reflections upon Longinus*: For there he has given so just a Vindication of those Great Men, whom he so well knows how to imitate, that whatsoever I can say after him, will appear flat and insipid. I shall therefore rather chuse to return to my Subject.

C. H. A. P.

CHAP. V.

Of Ancient and Modern Grammar.

Grammar is one of the Sciences which Sir William Temple says, that (k) no (k) Man ever disputed with the Ancients.

As this Assertion is expressed, it is a little ambiguous: It may be understood of the Skill of the Moderns in the Grammatical Analogy of *Latin* and *Greek*, or of their Skill in the Grammar of their Mother-Tongues. Besides, Grammar may either be considered *Mechanically*, or *Philosophically*. Those consider it *Mechanically*, who only examine the Idiotisms and Proprieties of every particular Language, and lay down Rules to teach them to others. Those consider it as *Philosophers*, who consider Language, with the Nature of Grammatical Analogy in general, and then carry down their Speculations to those particular Languages of which they are to discourse; who run over the several Steps, by which every Language has altered its *Idiom*; who enquire into the several Perfections and Imperfections of those Tongues with which they are acquainted, and (if they are living Languages) propose

propose Methods how to remedy them, or, at least, remove those Obscurities which are thereby occasioned in such Discourses where Truth is only regarded, and not Eloquence.

Now, this *Mechanical Grammar* of Greek and *Latin* has been very carefully studied by Modern Critics. *Sanctius*, *Scioppius*, and *Gerhard Vossius*, besides a great number of others, who have occasionally shewn their Skill in their Illustrations of Ancient Authors, have given evident Proofs how well they understood the *Latin* Tongue: So have *Caninius*, *Clenard*, *Gerhard Vossius*, and abundance more, in *Greek*: Wherein they have gone upon sure Grounds, since, besides a great Number of Books in both Languages, upon other Subjects, abundance of Grammatical Treatises, such as *Scholia upon Difficult Authors*, *Glossaries*, *Onomasticons*, *Etymologicons*, *Rudiments of Grammar*, and the like, have been preserved, and published by skilful Men (most of them at least) with great Care and Accuracy. From all which there seems to be Reason to believe, that some Modern Critics may have understood the Grammatical Construction of *Latin*, as well as *Varro*, or *Cæsar*; and of *Greek*, as well as *Aristarchus*, or *Hierodan*. But this cannot be pretended to

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be a new Invention ; for the Grammar of dead Languages can be only learned by Books : And since their Analogy can neither be encreased nor diminished, it must be left as we find it.

So that when Sir William Temple says, That no Man ever disputed Grammar with the Ancients ; if he means, that we cannot make a new Grammar of a dead Language, whose Analogy has been determined almost \overline{MM} Years, it is what can admit of no Dispute. But if he means, that Modern Languages have not been Grammatically examined, at least, not with that Care that some Ancient Tongues have been ; that is a Proposition which may, perhaps, be very justly questioned. And he, of all Men, ought not to have arraign'd the Modern Ignorance in Grammar, who puts *Delphos* for *Delphi*, every where in his *Essays*, tho' he knows that Proper Names borrow'd from *Latin* and *Greek* are always put in the Nominative-Case, in our Language. For those who find fault with others, ought to be critically exact in those Things at least themselves. But without making Personal Digressions, in the first place, it ought to be considered, that every Tongue has its own peculiar Form, as well as its proper Words ; not communicable to, nor to be regulated by

by the Analogy of another Language: Wherefore, he is the best *Grammatician*, who is the perfectest Master of the Analogy of the Language which he is about; and gives the truest Rules, by which another Man may learn it. Next, To apply this to our own Tongue, it may be certainly affirmed, That the *Grammar* of *English* is so far our own, that Skill in the Learned Languages is not necessary to comprehend it. *Ben. Johnson* was the first Man, that I know of, that did any Thing considerable in it: but he seems to have been too much possessed with the Analogy of *Latin* and *Greek*, to write a perfect Grammar of a Language whose Construction is so vastly different; tho' he falls into a contrary Fault, when he treats of the *English Syntax*, where he generally appeals to *Chaucer* and *Gower*, who lived before our Tongue had met with any of that Polishing, which, within these last *CC* Years, has made it appear almost entirely New. After him, came *Dr. Wallis*; who examined the *English* Tongue like a *Grammatician* and a *Philosopher* at once, and shewed great Skill in that Business: And of his *English Grammar*, one may venture to say, That it may be set against any Thing that is extant of the Ancients, of that kind: For, as *Sir William Temple* says

says upon another Occasion, there is a Strain of Philosophy, and curious Thought, in his previous Essay of the Formation of the Sounds of Letters ; and of Subtilty, in his Grammar, in the reducing of our Language under Genuine Rules of Art, that one would not expect in a Book of that kind.

The Care which the Modern Italians have taken to cultivate and refine their Language, is hardly to be believed by a People who have been so careless of their own as the English have been, till within these last XXX or XL Years. Volumes have been written against some Letters, and in favour of others (l). Cardinal Bembo drew up such large and exact Rules for the Italian, that one would have imagined they could not have received any Additions ; and yet Castelvetro made an Enlargement which was bigger than the Cardinal's Original Work, to which Salviati thought it necessary to add an Appendix (m). The Academy della Crusca have been above these C Years sifting their Language ; and with how great Accuracy and Pains they have examined it, their Vocabulary, which has had several Impressions, with vast Augmentations, from what it was at first, is a convincing Proof.

(l) H
and Z.

(m) Vid.
li Pensieri
diversi di
Tassoni, l.x.
c. 2.

In

by the Analogy of another Language: Wherefore, he is the best *Grammatician*, who is the perfectest Master of the Analogy of the Language which he is about; and gives the truest Rules, by which another Man may learn it. Next, To apply this to our own Tongue, it may be certainly affirmed, That the *Grammar* of *English* is so far our own, that Skill in the Learned Languages is not necessary to comprehend it. *Ben. Johnson* was the first Man, that I know of, that did any Thing considerable in it: but he seems to have been too much possessed with the Analogy of *Latin* and *Greek*, to write a perfect Grammar of a Language whose Construction is so vastly different; tho' he falls into a contrary Fault, when he treats of the *English Syntax*, where he generally appeals to *Chaucer* and *Gower*, who lived before our Tongue had met with any of that Polishing, which, within these last *CC* Years, has made it appear almost entirely New. After him, came *Dr. Wallis*; who examined the *English* Tongue like a *Grammatician* and a *Philosopher* at once, and shewed great Skill in that Business: And of his *English Grammar*, one may venture to say, That it may be set against any Thing that is extant of the Ancients, of that kind: For, as *Sir William Temple*

says

says upon another Occasion, there is a *Strain of Philosophy, and curious Thought*, in his previous *Essay of the Formation of the Sounds of Letters*; and of *Subtilty*, in his *Grammar*, in the reducing of our Language under Genuine Rules of Art, that one would not expect in a Book of that kind.

The Care which the *Modern Italians* have taken to cultivate and refine their Language, is hardly to be believed by a People who have been so careless of their own as the *English* have been, till within these last XXX or XL Years. Volumes have been written against some Letters, and in favour of others (1). Cardinal Bembo drew up such large and exact Rules for the *Italian*, that one would have imagined they could not have received any Additions; and yet *Castelvetro* made an Enlargement which was bigger than the Cardinal's Original Work, to which *Salviati* thought it necessary to add an *Appendix* (m). The Academy della *Crusca* have been above these ̄ Years sifting their Language; and with how great Accuracy and Pains they have examined it, their *Vocabulary*, which has had several Impressions, with vast Augmentations, from what it was at first, is a convincing Proof.

(1) H
and Z.

(m) Vid.
li *Pensieri*
diversi di
Tassoni, l.x.
c. 2.

In

In France, since the Institution of the *French Academy*, the *Grammar* of their own Language has been studied with great Care. *Isocrates* himself could not be more nice in the Numbers of his Periods, than these *Academicians* have been in settling the Phraseology, in fixing the Standard of Words, and in making their Sentences, as well as they could, numerous and flowing. Their *Dictionary*, which is come out at last; *Vaugelas's*, *Bouhours's* and *Menage's* *Remarks upon the French Tongue*, *Richelier's* and *Furetiere's* *Dictionaries*, with abundance of other Books of that kind, which, though not all written by Members of the *Academy*, yet are all Imitations of the Patterns which they first set, are Evidences of this their Care. This *Sir William* somewhere owns: And though he there supposes, that these *Filers* and *Polishers* may have taken away a great part of the Strength of the Tongue, (which, in the main, is true enough,) yet that is no Objection against their Critical Skill in *Grammar*; upon which Account only their Labours are here taken notice of. So much for the *Mechanical Part* of *Grammar*.

Philosophical Grammar was never, that we know of, much minded by the Ancients. So that any great Performances
of

of this sort, are to be looked upon as Modern Additions to the Commonwealth of Learning. The most considerable Book of that kind, that I know of, is Bishop *Wilkin's Essay towards a Real Character, and Philosophical Language*: A Work, which those who have studied, think they can never commend enough. To this one ought to add, what may be found relating to the same Subject, in the Third Book of Mr. *Lock's Essay of Humane Understanding*.

C H A P. VI.

*Of Ancient and Modern Architecture,
Statuary, and Painting.*

Hitherto the *Moderns* seem to have had very little Reason to boast of their Acquisitions and Improvements; Let us see now what they may have hereafter. In those Arts, sure, if in any, they may challenge the Preference, which depending upon great Numbers of Experiments and Observations, that do not every Day occur, cannot be supposed to be brought to Perfection in a few Ages.
Among

Here therefore I at first intended to have left off; and I thought my self obliged to resign what I believed could not be maintained, when Monsieur Perrault's *Parallel of the Ancients and Moderns* came to my Hands. His Skill in *Architecture* and *Mechanicks*, may, in all probability, be relied upon; since the *French King*, who is not over-apt to conferr Employments upon Men that do not understand how to manage them, has made him (n) *Chief Surveyor of his Buildings*. And his long Conversation with the finest Pieces of Antiquity, and of these Later Ages, which his Employment necessarily led him to, fitted him for judging of these Matters better than other Men. So that, though there might be great Reason not to agree to his Hypothesis of the *State of Ancient and Modern Eloquence and Poesie*; yet in Things of this Nature, where the *Mediums* of Judging are quite different, and where Geometrical Rules of Proportion, which in their own Nature are unalterable, go very far to determine the Question, his Judgment seemed to be of great weight. I shall therefore chuse rather to give a short View of what he says upon these Subjects, than to pass any Censure upon them of my own.

(n) *Premier Commis de la Surintendance des Batimens de France.*

Pag. 88.

Of *Architecture*, he says; 'That though the Moderns have received the Knowledge of the Five Orders from the Ancients, yet if they employ it to better Purposes, if their Buildings be more useful, and more beautiful, then they must be allowed to be the better Architects. For it is in *Architecture*, as it is in *Oratory*; as he that lays down Rules, when and how to use *Metaphors*, *Hyperboles*, *Apostrophe's*, or any other Figures of *Rhetoric*, may very often not be so good an Orator as he that uses them judiciously in his Discourses. So he that teaches what a *Pillar*, an *Architrave* or a *Cornice* is, and that instructs another in the Rules of Proportion, so as to adjust all the Parts of each of the several Orders aright, may not be so good an Architect as he that builds a magnificent Temple, or a noble Palace, that shall answer all those Ends for which such Structures are designed. That the chief Reason why the *Doric*, the *Ionic*, or the *Corinthian* Models have pleased so much, is, partly because the Eye has been long accustomed to them, and partly because they have been made use of by Men who understood and followed those other Rules which will eternally please, upon the score of real Usefulness; whereas the

Five

‘ Five Orders owe their Authority to
‘ Custom, rather than to Nature. That
‘ these Universal Rules are; To make those Pag. 94.
‘ Buildings which will bear it, lofty and
‘ wide : In Stone-work, to use the largest,
‘ the smoothest, and the evenest Stones :
‘ To make the Joints almost imperceptible :
‘ To place the Perpendicular Parts of the
‘ Work exactly Perpendicular, and the
‘ Horizontal Parts exactly Horizontal : To
‘ support the weak Parts of the Work by
‘ the strong : to cut Square Figures perfectly
‘ Square, and Round Figures perfectly
‘ Round : To hew the whole exactly true ;
‘ and to fix all the Corners of the Work
‘ evenly, as they ought to be. That these
‘ Rules, well observ’d, will always please
‘ even those who never understood one
‘ single Term of Art : Whereas the other
‘ accidental Beauties, such as he supposes
‘ *Doric, Ionic, or Corinthian* Work to be,
‘ please, only because they are found to-
‘ gether with these, though their being
‘ the most conspicuous Parts of a Build-
‘ ing, made them be first observ’d : From
‘ whence Men began to fancy Inherent
‘ Beauties in that, which owes the greatest
‘ part of its Charms to the good Company
‘ in which it is taken notice of, and so in
‘ time delighted, when it was seen alone.
‘ That otherwise it would be impossible Pag. 97, 99

(o) Ban-
deaux de la
voute du
Temple.

Pag. 111.

Pag. 113.

Pag. 114.

Pag. 115.

that there should be so great a Variety in the Assigning of the Proportions of the several Orders; no two eminent Architects ever keeping to the same Measure, though they have neither spoiled nor lessened the Beauty of their Works. That if we go to Particulars, we shall not find (for the purpose) in the *Pantheon* at *Rome*, which is the most regular, and the most magnificent ancient Building now extant, two Pillars of a like thickness. That (o) the Girders of the arched Roof do not lie full upon the great Columns or Pilasters; but some quite over the Cavities of the Windows which are underneath; others half over the Windows, and half upon the Columns or Pilasters. That the Modillions of the Cornice are not exactly over the Middle of the Chapters of the Pillars. That in the Fronts of the *Piazza's*, the Number of the Modillions in Sides of equal length is not alike: With several Instances of Negligence, which would now be thought unpardonable. That, generally speaking, in other Buildings, their Floors were twice as thick as their Walls; which loaded them exceedingly, to no purpose. That their Way of Laying Stones in Lozenges, was inconvenient, as well as troublesome; since every Stone

‘ so placed, was a Wedge to force those
‘ asunder on which it leaned. That they Pag. 117.
‘ did not understand the nicest Thing in
‘ Architecture, which is, the Art of Cut-
‘ ting Stones in such a manner, as that
‘ several Pieces might be jointed one into
‘ another ; for want of which, they made
‘ their Vaults of Brick plaister’d over ;
‘ and their Architraves of Wood, or of
‘ one single Stone ; which obliged them
‘ to set their Pillars closer to one ano-
‘ ther than otherwise had been necessary :
‘ Whereas, by this Art of Cutting Stone,
‘ Arches have been made almost flat ; Stair-
‘ Cases of a vast height have been raised,
‘ where the Spectator is at a loss to tell
‘ what supports them ; whilst the Stones
‘ are jointed into each other in such a man-
‘ ner, that they mutually bear up them-
‘ selves, without any Rest but the Wall,
‘ into which the innermost Stones are
‘ fastened. That they had not Engines to Pag. 118.
‘ raise their Stones to any considerable
‘ height ; but if the Work was low, they
‘ carried them upon their Shoulders ; if
‘ high, they raised sloping Mounts of
‘ Earth level with their Work, by which
‘ they rolled up their Stones to what
‘ height they pleased ; For, as for the
‘ Engines for Raising of Stones, in *Vitru-*
‘ *vius*, those who understand Mechanics,

Fig. 119,
120.

‘are agreed, that they can never be very serviceable. That it is not the Largeness of a Building, but the well executing of a Noble Design, which commends an Architect; otherwise the *Ægyptian* Pyramids, as they are the greatest, would also be the finest structures in the World. And last of all; That the *French King's* Palace at *Versailles*, and the Frontispiece of the *Louvre*, discover more true Skill in Architecture of all sorts, than any thing which the Ancients ever performed, if we may judge of what is lost, by what remains.’

What Monsieur *Perrault* says of the Ancients Way of Raising their Stone, may be confirmed by the Accounts which *Garcilasso de la Vega*, and others, give of the vast Buildings of massy Stone which the *Spaniards* found in *Peru*, upon their first Arrival. It is most certain, that the *Peruvians* knew not the Use of Iron; and by consequence, could make no Engines very serviceable for such a purpose. They ground their Stones one against another, to smooth them; and afterwards they raised them with Leavers: And thus, with Multitude of Hands they reared such Structures as appeared wonderful even to Men acquainted with Modern Architecture.

Of Sculpture, he says; ' That we are
 ' to distinguish between entire Statues,
 ' and *Basso Relievo's*; and in entire Statues,
 ' between Naked and Cloathed Pieces.
 ' The Naked Images of the Ancients, as
 ' *Hercules, Apollo, Diana, the Gladiators,*
 ' *the Wrestlers, Bacchus, Laocoon,* and some
 ' few more, are truly admirable: They
 ' shew something extremely Noble, which Pag. 125.
 ' one wants Words for, that is not to be
 ' found in Modern Work: Though he
 ' cannot tell whether Age does not con-
 ' tribute to the Beauty. That if some of
 ' the most excellent of the Modern Pieces
 ' should be preserved \overline{MD} or \overline{MM} Years;
 ' or ting'd with some Chymical Water,
 ' that could in a short time make them
 ' appear Antique, it is probable they would
 ' be viewed with the same Veneration
 ' which is now payed to Ancient Statues.
 ' That the Naked Sculpture of single Pag. 129.
 ' Figures is a very noble Art indeed, but
 ' the simplest of any that has ever charmed
 ' Mankind; not being burthen'd with a
 ' Multiplicity of Rules, nor needing the
 ' Knowledge of any other Art to com-
 ' plet it; since a Man that has a Genius
 ' and Application, wants only a beautiful
 ' Model in a proper Posture, which he is
 ' faithfully to copy: And therefore, That
 ' in the Cloathed Statues of the Ancients, Pag. 121,
 ' the 122, 123.

- ' the Drapery wants much of that Art
 ' which is discernible in some Modern
 ' Pieces; they could never make the
 ' Cloaths fit loose to the Bodies, nor ma-
 ' nage the Folds so as to appear easie and
 ' flowing, like well-made Garments upon
 Pag. 129. ' living Bodies. That the *Basso Relievo's*
 ' of the Ancients plainly shew, that the
 ' Statuaries in those Days did not under-
 ' stand all the Precepts that are necessary
 ' to compleat their Art; because they
 ' never observed the Rules of Perspective,
 ' they did not lessen their Figures gradual-
 ' ly, to make them suitable to the Place
 ' where they stood, but set them almost
 ' all upon the same Line; so that those
 ' behind were as large, and as distin-
 ' guishable, as those before; as if they had
 ' been purposely mounted upon Steps, to
 ' be seen over one another's Heads. That
 Pag. 130. ' this is visible in the *Columna Trajana*, at
 ' this Day, though that is the noblest an-
 ' cient Performance in *Basso Relievo* still
 ' remaining; wherein, together with some
 Pag. 132. ' very beautiful Airs of some of the Heads,
 ' and some very happy Postures, one may
 ' discern that there is scarce any Art in the
 ' Composition of the whole, no gradual
 ' lessening of the *Relievo* in any part,
 ' with great Ignorance in Perspective in
 ' the whole. That the ancient Works in
 ' *Basso*

‘ *Basso Relievo* did not truly deserve that Name, being properly entire Statues, either sawed down perpendicularly, from Head to Foot, with the fore-part fasten’d or glued to a flat Ground, or sunk half way in: Whereas the true Art consists in raising the Figures so from their Ground, which is of the same Piece, that with two or three Inches of *Relievo*, they may appear like distinct Images sunk into the Ground, some more, some less, according to the several Distances in which they ought to be placed. Pag. 133.

Of *Painting*, he says; ‘ That Three Things are necessary to make a perfect Picture; *To represent the Figures truly; To express the Passions naturally; and, To put the whole judiciously together.* For the *First*, It is necessary that all the Out-Lines be justly Drawn, and that every Part be properly Coloured. For the *Second*, It is necessary that the Painter should hit the different Airs and Characters of the Face, with all the Postures of the Figures, so as to express what they do, and what they think. *The whole is judiciously put together*, when every several Figure is set in the Place in which we see it, for a particular Purpose; and the Colouring gradually weakened, Pag. 143.

- ' the Drapery wants much of that Art
 ' which is discernible in some Modern
 ' Pieces; they could never make the
 ' Cloaths fit loose to the Bodies, nor ma-
 ' nage the Folds so as to appear easie and
 ' flowing, like well-made Garments upon
 Pag. 129. ' living Bodies. That the *Basso Relievo's*
 ' of the Ancients plainly shew, that the
 ' Statuaries in those Days did not under-
 ' stand all the Precepts that are necessary
 ' to compleat their Art; because they
 ' never observed the Rules of Perspective,
 ' they did not lessen their Figures gradual-
 ' ly, to make them suitable to the Place
 ' where they stood, but set them almost
 ' all upon the same Line; so that those
 ' behind were as large, and as distin-
 ' guishable, as those before; as if they had
 ' been purposely mounted upon Steps, to
 ' be seen over one another's Heads. That
 Pag. 130. ' this is visible in the *Columna Trajana*, at
 ' this Day, though that is the noblest an-
 ' cient Performance in *Basso Relievo* still
 ' remaining; wherein, together with some
 Pag. 131. ' very beautiful Airs of some of the Heads,
 ' and some very happy Postures, one may
 ' discern that there is scarce any Art in the
 ' Composition of the whole, no gradual
 ' lessening of the *Relievo* in any part,
 ' with great Ignorance in Perspective in
 ' the whole. That the ancient Works in
 ' *Basso*

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Pag. 135.

Pag. 136.

Pag. 138.

weakened, so as to suit that part of the
 Plain in which every Figure appears.
 All which is as applicable to the several
 Parts of a Picture that has but one Fi-
 gure, as to the several Figures in a
 Picture that has more. That if we
 judge of Ancient and Modern Paintings
 by this Rule, we may divide them into
 Three Classes: The First takes in the
 Age of *Zeuxis*, *Apelles*, *Timanthes*, and
 the rest that are so much admired in An-
 tiquity. The Second takes in the Age
 of *Raphaël*, *Titian*, *Paul Veronese*, and
 those other great Masters that flourished
 in *Italy* in the last Age. The Third con-
 tains the Painters of our own Age, such
 as *Poussin*, *Le Brun*, and the like. That if
 we may judge of the Worth of the Painters
 of the First Classe, by the Commendations
 which have been given them, we have
 Reason to say, either that their Admirers
 did not understand Painting well, or
 that themselves were not so valuable,
 or both. That whereas *Zeuxis* is said to
 have painted a Bunch of Grapes so natu-
 rally, that the Birds peck'd at them;
 Cooks have, of late Years, reached at
 Partridges and Capons, painted in Kit-
 chins; which has made By-standers smile,
 without raising the Painter's Reputation
 to any great height. That the Contention
 between

' between *Protophenes* and *Apelles* shewed Pag. 139.
 ' the Infancy of their Art : *Apelles* was
 ' wonderfully applauded for Drawing a
 ' very fine Stroke upon a Cloth : *Proto-*
 ' *phenes* drew a Second over that, in a dif-
 ' ferent Colour ; which *Apelles* split in-
 ' to two, by a Third. Yet this was not Pag. 141.
 ' so much as what *Giotto* did, who lived
 ' in the Beginning of the Restoration of
 ' Painting in *Italy*, who drew, without
 ' Compasses, with a single Stroke of a
 ' Pencil, upon a Sheet of Paper, an O,
 ' so exquisitely round, that it is still Pro-
 ' verbial among the *Italians*, when they
 ' would describe a Man that is egregiously
 ' stupid, to say, *That he is as round as*
 ' *the O of Giotto*. That when *Poussin's* Pag. 142.
 ' Hand shook so much, that he could scarce
 ' manage his Pencil, he painted some Pieces
 ' of inestimable Value ; and yet very in-
 ' different Painters would have divided
 ' every Line that he drew, into nine or
 ' ten Parts. That the *Chineses*, who can-
 ' not yet express Life and Passion in their
 ' Pieces, will draw the Hairs of the Face and
 ' Beard so fine, that one may part them
 ' with the Eye from one another, and tell
 ' them. Though the Ancients went much Pag. 150.
 ' beyond all this ; for the Remains of the
 ' Ancient Painting discover great Skill in
 ' Designing, great Judgment in Ordering
 ' of

' of the Postures, much Nobleness and Ma-
 ' jesty in the Airs of the Heads ; but little
 ' Design, at the same time, in the Mixing
 ' of their Colours, and none at all in the
 ' Perspective, or the Placing of the Fi-
 ' gures. That their Colouring is all equal-
 ' ly strong ; nothing comes forward, no-
 ' thing falls back in their Pictures ; the Fi-
 ' gures are almost all upon a Line : So that
 ' their Paintings appear like Pieces in *Basso-*
 ' *Relievo*, coloured ; all dry and unmoveable,
 ' without Union, without Connexion, and
 ' that living Softness which distinguishes
 ' Pictures from Statues in Marble or Cop-
 ' per. Wherefore, since the Paintings of
 ' these Ancient Masters were justly design'd,
 ' and the Passions of every several Figure
 ' naturally expressed, which are the Things
 ' that the generality of Judges most ad-
 ' mire, who cannot discern those Beauties
 ' that result from a judicious Composition
 ' of the whole, so well as they can the
 ' distinct Beauties of the several Parts,
 ' there is no wonder that *Zeuxis* and *A-*
 ' *pelles*, and the other Ancient Masters,
 ' were so famous, and so well rewarded.
 ' For, of the Three Things at first assigned,
 ' as necessary to a Perfect Painter, true
 ' Drawing, with proper Colouring, affect
 ' the Senies ; natural Expressing of the Mo-
 ' tions of the Soul, move the Passions :
 ' whereas

‘ whereas a Judicious Composition of the whole, which is discernible in an Artful Pag. 146.

‘ Distribution of Lights and Shades, in the gradual Lessening of Figures, according to their respective Places, in making every Figure answer to that particular Purpose which it is intended to represent, affects the Understanding only ; and so, instead of Charming, will rather disgust an unskilful Spectator. Such a Pag. 147.

‘ Man, and under this Head almost all Mankind may be comprehended, will contentedly forgive the grossest Faults in Perspective, if the Figures are but very prominent, and the View not darkened by too much Shade ; which, in their Opinion, spoils all Faces, especially of Friends, whose Images chiefly such Men are desirous to see.’

When he compares the Paintings of *Raphaël* and *Le Brun* together, he observes, That *Raphaël* seems to have had the Pag. 159.

‘ greater Genius of the two ; that there is something so Noble in his Postures, and the Airs of his Heads ; something so just in his Designs, so perfect in the Mixture of his Colours, that his *St. Michael* will always be thought the first Picture in the World, unless his *H. Family* should dispute Precedency with it. In short, he says, That if we consider the Persons Pag. 160.

‘ of

of *Raphaël* and *Le Brun*. *Raphaël* perhaps
 may be the greater Man: But if we con-
 sider the Art, as a Collection of Rules,
 all necessary to be observed to make it
 perfect, it appears much more compleat
 in Monsieur *Le Brun*'s Pieces: For *Ra-
 phaël* understood so little of the gradual
 Lessening of Light, and Weakening of
 Colours, which is caused by the Inter-
 position of the Air, that the hindermost
 Figures in his Pieces appear almost as
 plain as the foremost; and the Leaves of
 distant Trees, almost as visible as of those
 near at hand; and the Windows of a
 Building four Leagues off, may all be
 counted as easily as of one that is within
 twenty Paces. Nay, he cannot tell whe-
 ther some part of that Beauty, now so
 peculiar to *Raphaël*'s Pieces, may not,
 in a great measure, be owing to Time,
 which adds a real Beauty to good Paint-
 ings. For, in the Works of this kind, as
 in New-kill'd Meat, or New-gather'd
 Fruit, there is a Rawness and Sharpness,
 which Time alone concocts and sweetens,
 by mortifying that which has too much
 Life, by weakening that which is too
 strong, and by mixing the Extremities
 of every Colour entirely into one ano-
 ther. So that no Man can tell what
 will be the Beauty of *Le Brun*'s Family
 of

‘ of Darius, Alexander’s Triumph, the De-
 ‘ feat of Porus, and some other Pieces of
 ‘ equal Force, when Time shall have done
 ‘ her Work, and shall have added those
 ‘ Graces which are now so remarkable in
 ‘ the *St. Michael*, and the *H. Family*. One
 ‘ may already observe, that Monsieur
 ‘ *Le Brun*’s Pieces begin to soften; and
 ‘ that Time has, in part, added those
 ‘ Graces which It alone can give, by
 ‘ sweetning what was left on purpose,
 ‘ by the judicious Painter, to amuse its
 ‘ Activity, and to keep it from the Sub-
 ‘ stance of the Work.’ Thus far Mon-
 ‘ sieur *Perrault*.

Whether his Reasonings are just, I dare
 not determine: Thus much may very
 probably be inferred, That in these Things
 also the World does not Decay so fast as
 Sir William Temple believes; and that
Poussin, *Le Brun* and *Bernini* have made
 it evident by their Performances in Paint-
 ing and Statuary, (p) That we have had (p) Pag. 52.
 Masters in both these Arts, who have de-
 served a Rank with those that flourished in
 the last Age, after they were again restored
 to these Parts of the World.

CHAP.

C H A P. VII.

General Reflections relating to the following Chapters : With an Account of Sir William Temple's Hypothesis of the History of Learning.

IF the bold Claims of confident and numerous Pretenders, might, because of their Confidence and Numbers, be much relied on, it were an easie Thing to determine upon the remaining Parts of Learning, hereafter to be discoursed of. The generality of the Learned have given the *Ancients* the Preference in those Arts and Sciences which have hitherto been considered : But for the Precedency in those Parts of Learning which still remain to be enquired into, the *Moderns* have put in their Claim, with great Briskness. Among this sort, I reckon *Mathematical* and *Physical Sciences*, considered in their largest Extent. These are Things which have no Dependence upon the Opinions of Men for their Truth ; they will admit of fixed and undisputed *Mediums* of Comparison and Judgment : So that, though it may be always debated, who have been the

the best Orators, or who the best Poets ; yet it cannot always be a Matter of Controversie, who have been the greatest Geometers, Arithmeticians, Astronomers, Musicians, Anatomists, Chymists, Botanists, or the like ; because a fair Comparison between the Inventions, Observations, Experiments and Collections of the contending Parties, must certainly put an End to the Dispute, and give full Satisfaction to all Sides.

The Thing contended for, is, the Knowledge of Nature ; what the Appearances are which it exhibits, and how they are exhibited ; thereby to shew how they may be enlarged, and diversified, and Impediments of any sort removed. In order to this, it will be necessary, (1.) To find out all the several Affections and Properties of Quantity, abstractedly considered ; with the Proportions of its Parts and Kinds, either severally considered, or compared and compounded with one another ; either as they may be in Motion, or at Rest : This is properly the Mathematician's Business. (2.) To collect great Numbers of Observations, and to make a vast Variety of Experiments upon all sorts of Natural Bodies. And because this cannot be done without proper Tools, (3.) To contrive such Instruments, by which the

Constituent Parts of the Universe; and of all its Parts, even the most minute, or the most remote, may lie more open to our View; and their Motions, or other Affections, be better calculated and examined, than could otherwise have been done by our unassisted Senses. (4.) To range all the several Species of Natural Things under proper Heads; and assign fit Characteristicks, or Marks, whereby they may be readily found out, and distinguished from one another. (5.) To adapt all the Catholick Affections of Matter and Motion to all the known Appearances of Things, so as to be able to tell how Nature works; and, in some particular Cases, to command her. This will take in *Astronomy*, *Mechanics*, *Optics*, *Music*, with the other *Physico-Mathematical* and *Physico-Mechanical* Parts of Knowledge; as also, *Anatomy*, *Chymistry*, with the whole Extent of *Natural History*. It will help us to make a just Comparison between the *Ancient* and *Modern Physics*; that so we may certainly determine who Philosophized best, *Aristotle* and *Democritus*, or *Mr. Boyle* and *Mr. Newton*.

In these Things therefore the Comparison is to be made, wherein one can go no higher than the Age of *Hippocrates*, *Aristotle* and *Theophrastus*; because the Writings

Writings of the Philosophers before them are all lost. It may therefore be plausibly objected, That this is no fair Way of Proceeding, because the *Egyptians* and *Chaldeans* were Famous for many Parts of real Learning long before; from whom *Pythagoras*, *Thales*, *Plato*, and all the other *Græcian* Philosophers, borrow'd what they knew. This *Sir William Temple* insists at large upon; so that it will be necessary to examine the Claims of these Nations to Universal Learning: In doing of which, I shall follow *Sir William Temple's* Method; first I shall give a short Abstract of his Hypothesis, and then enquire how far it may be relied on.

Sir William Temple tells us, That the chiefest Argument that is produced in behalf of the Moderns, is; (q) That (q) Pag. 5.
'they have the Advantage of the Ancients Discoveries to help their own. So that, like Dwarfs upon Giants Shoulders, they must needs see farther than the Giants themselves.' To weaken this, we are told, (r) That those whom we (r) Pag. 6. 10.
'call Ancients, are Moderns, if compared to those who are ancients than they. And that there were vast Lakes of Learning in *Egypt*, *Chaldæa*, *India* and *China*; where it stagnated for many Ages, till the Greeks brought Buckets, and drew it out.

The Question therefore which is first to be asked here, is, *Where are the Books and Monuments wherein these Treasures were deposited for so many Ages?* And because they are not to be found, Sir William Temple makes a doubt, (s) *Whether Books advance any other Science, beyond the particular Records of Actions, or Registers of Time.* He may resolve it soon, if he enquires how far a Man can go in Astronomical Calculations, for which the Chaldeans are said to be so Famous, without the Use of Letters. The Peruvian Antiquities, which he there alledges, for Twelve or Thirteen Generations, from *Mango Capac*, to *Atahualpa*, were not of above $\bar{\text{D}}$ Years standing. The Mexican Accounts were not so old, and yet these, though very rude, needed Helps to be brought down to us. The Peruvian Conveyances of Knowledge, according to *Garcilasso de la Vega*, were not purely Traditionary, but were Fringes of Cotton, of several Colours, tied and woven with a vast Variety of Knots, which had all determinate Meanings; and so supplied the Use of Letters, in a tolerable degree: And the Mexican Antiquities were preserved, after a sort, by Pictures; of which we have a Specimen in Purchas's Pilgrim. So that when Sir William Temple urges

the

the Traditions of these People, to prove that Knowledge may be conveyed to Posterity without Letters, he proves only what is not disputed, namely, That Knowledge can be imperfectly conveyed to Posterity without Letters; not that Tradition can preserve Learning as well as Books, or something equivalent.

But since Sir William Temple lays no great Weight upon this Evasion, I ought not to insist any longer upon it. He says therefore, (c) That it is a Question, (c) Pag. 6, whether the Invention of Printing has multiplied Books, or only the Copies of them; since, if we believe that there were Six Hundred Thousand Books in the *Ptolemaean* Library, we shall hardly pretend to equal it by any of ours, nor perhaps by all put together; that is, we shall scarce be able to produce so many Originals that have lived any Time, and thereby given Testimony of their having been thought worth preserving. All this, as it is urged by Sir William Temple, is liable to great Exception. For, (r.) If we should allow that there is no Hyperbole in the Number of Books in the *Ptolemaean* Library, yet we are not to take our Estimate by the common Way of Reckoning. Every Oration of *Demosthenes* and *Isocrates*, every Play of *Æschylus* or

Aristophanes, every Discourse of *Plato* or *Aristotle*, was anciently called a Volume. This will lessen the Number to us, who take whole Collections of every Author's Works in one Lump; and accordingly give Names to them in our Catalogues, if printed together, under one Title.

(2.) Sir *William Temple* seems to take it for granted, that all these Books were *Originals*; that is to say, Books worth preserving; which is more than any Man can now prove. I suppose he himself

(1) Ibid.

believes that there were Ancients of all Sorts and Sizes, as well as there are Moderns now. And he that raises a Library, takes in Books of all Values; since bad Books have their Uses to Learned Men, as well as good ones. So that, for any Thing we know to the contrary, there might have been in this *Alexandrian* Li-

(u) Ibid.

brary a great Number of (u) *Scribbles*, that, like *Mushrooms* or *Flies*, are born and die in small Circles of Time.

(3.) The World can make a better Judgment of the Value of what is lost, at least, as far as it relates to the present Enquiry, than one at first View might perhaps imagine. The lost Books of the *Antiquities* of several Nations, of their Civil History, of the Limits of their several Empires and Commonwealths, of their Superstitious Rites and Ceremonies,

remories, of their *Laws and Manners*, or of any Thing immediately relating to any of these, are not here to be considered; because it cannot be pretended that the Moderns could know any of these Things, but as they were taught. So neither is what may have related to *Ethics, Politics, Poësie* and *Oratory* here to be urged, since in those Matters, the Worth of Ancient Knowledge has already been asserted. So that we are only to enquire what and how great the Loss is of all those Books upon *Natural* or *Mathematical Arguments*, which were preserved in the *Alexandrian, Asiatick* and *Roman* Libraries, or mentioned in the Writings of the Ancient Philosophers and Historians. By which Deduction, the former Number will be yet again considerably lessened.

Now, a very true Judgment of Ancient Skill in *Natural History* may be formed out of *Pliny*, whose Extracts of Books, still extant, are so particular for the present Purpose, that there is Reason to believe they were not carelessly made of those that are lost. *Galen* seems to have read whatever he could meet with relating to *Medicine*, in all its Parts: And the *Opinions* of Abundance of Authors, which are no where else preserved, may be discovered out of his Books; of the

famous ones especially; whom, at every turn, he either contradicts, or produces to fortifie his own Assertions. *Ptolemy* gives an Account of the Old Astronomy, in his *Almagest*. Very many Particulars of the Inventions and Methods of Ancient Geometers are to be found in the *Mathematical Collections* of *Pappus*. The Opinions of the different Sects of Philosophers are well enough preserved in the entire Treatises of the several Philosophers who were of their Sects; or in the Discourses of others, who occasionally or expressly confute what they say. So that I am apt to think, that the *Philosophical* and *Mathematical Learning* of the Ancients is better conveyed us than the *Civil*; the Books which treated of those Subjects suiting better the Genius of several Men, and of several Nations too: For which Reason the *Arabs* translated the most considerable *Greek Books* of this kind; as, *Euclid*, *Apollonius*, *Aristotle*, *Epictetus*, *Cebes*, and Abundance more, that had written of Philosophy or Mathematicks, into their own Language; whilst they let Books of Antiquity and Civil History be unregarded.

Sir *William Temple's* next Enquiry, is From whence both the Ancients and Moderns have received their Knowledge? His Method

Method does not seem to be very natural, nor his Question very proper ; since, if Discoveries are once made, it is not so material to know who taught the several Inventors, as what these Inventors first taught others. But setting that aside, the Sum of what he says, in short, is this :

(w) ' The Moderns gather all their (w) Pag. Learning out of Books in Universities ; 11, 12.

' which are but dumb Guides, that can lead Men but one Way, without being able to set them right, if they should wander from it. These Books, besides, are very few ; the Remains of the Writings of here and there an Author, that wrote from the Time of *Hippocrates*, to *M. Antoninus*, in the compals of Six or Seven Hundred Years : Whereas *Thales* and *Pythagoras* took another sort of a Method ; *Thales* acquired his Knowledge in *Ægypt*, *Phœnicia*, *Delphos*, and *Crete* ; (x) *Pythagoras* spent Twenty- (x) Pag. Two Years in *Ægypt*, and Twelve Years 13, 14, 15. more in *Chaldea*, and then returned, laden with all their Stores ; and not contented with that, went into *Æthiopia*, *Arabia*, *India* and *Crete* ; and visited *Delphos*, and all the renowned Oracles in the World.

' Left

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' *thiopia*, *Arabia*, *India* and *Crete*; and
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' Oracles in the World.

' Left

(1) Pag.
16, 17.

(1) 'Left we should wonder why Pythagoras went so far, we are told, that the Indian Brachmans were so careful to educate those who were intended for Scholars, that as soon as the Mothers found themselves with Child, much Thought and Diligence was employed about their Diet and Entertainment, to furnish them with pleasant Imaginations, to compose their Mind and their Sleeps with the best Temper, during the Time that they carry'd their Burthen. It is certain, that they must needs have been very Learned, since they were obliged to spend Thirty Seven Years in getting Instruction: Their Knowledge was all Traditional; they thought the World was Round, and made by a Spirit; they believed the Transmigration of Souls; and they esteemed Sickness such a Mark of Intemperance, that when they found themselves indisposed, they died out of Shame and Sullenness, though some lived an Hundred and Fifty or Two Hundred Years. (2) These Indians had their Knowledge, in all probability, from China, a Country where Learning had been in request from the Time of Fohius, their first King. It is to be presumed, that they communicated of their Store to other Nations, though they them-

(2) Pag.
22, 23.

themselves have few Foot-steps of it remaining, besides the Writings of *Confucius*, which are chiefly Moral and Political; because one of their Kings, who desired that the Memory of every Thing should begin with himself, caused Books of all sorts, not relating to Physic and Agriculture, to be destroyed.

(a) 'From *India*, Learning was carried into *Æthiopia* and *Arabia*; thence, by the Way of the *Red Sea*, it came in to *Phœnicia*; and the *Ægyptians* learn'd it of the *Æthiopians*. (a) Page 21.

This is a short Account of the History of Learning, as *Sir William Temple* has deduced it from its most ancient Beginnings. The Exceptions which may be made against it are many, and yet more against the Conclusions which he draws from it. For, though it be certain that the *Ægyptians* had the Grounds and Elements of most parts of real Learning among them earlier than the *Greeks*, yet that is no Argument why the *Græcians* should not go beyond their Teachers, or why the Moderns might not out-doe them both.

Before I examine *Sir William Temple's* Scheme, Step by Step, I shall offer, as the Geometers do, some few Things as *Postulata*; which are so very plain, that they

they will be assented to as soon as they are proposed. (1.) That all Men who make a Mystery of Matters of Learning, and industriously oblige their Scholars to conceal their Dictates, give the World great Reason to suspect that their Knowledge is all Juggling and Trick. (2.) That he that has only a Moral Persuasion of the Truth of any Proposition, which is capable of Natural Evidence, cannot so properly be esteemed the Inventor, or the Discoverer rather, of that Proposition, as another Man, who, though he lived many Ages after, brings such Evidences of its Certainty, as are sufficient to convince all competent Judges; especially when his Reasonings are founded upon Observations and Experiments drawn from, and made upon the Things Themselves. (3.) That no Pretences to greater Merits of Knowledge, grounded upon Accounts of Long Successions of Learned Men in any Country, ought to gain Belief, when set against the Learning of other Nations, which make no such Pretences, unless Inventions and Discoveries answerable to those Advantages, be produced by their Advocates. (4.) That we cannot judge of Characters of Things and Persons at a great Distance, when given at Second-hand, unless we knew exactly how

how capable those Persons, from whom such Characters were first taken, were to pass a right Judgment upon such subjects; and also the particular Motives that biassed them to pass such Censures. If *Archimedes* should, upon his own Knowledge, speak with Admiration of the *Egyptian* Geometry, his Judgment would be very considerable. But if he should speak respectfully of it, only because *Pythagoras* did so before him, it might, perhaps, signify but very little. (5.) That excessive Commendations of any Art or Science whatsoever, as also of the Learning of any particular Men or Nations, only prove that the Persons who give such Characters never heard of any Thing or Person that was more excellent in that Way; and therefore that Admiration may be as well supposed to proceed from their own Ignorance, as from the real Excellency of the Persons or Things; unless their respective Abilities are otherwise known.

CHAP.

C H A P. VIII.

Of the Learning of Pythagoras, and
the most Ancient Philosophers of
Greece.

IN my Enquiries into the Progress of Learning, during its obscurer Ages, or those, at least, which are so to us at this Distance, I shall begin with the Accounts which are given of the Learning of *Pythagoras*, rather than those of the more Ancient *Grecian* Sages; because his School made a much greater Figure in the World, than any of those which preceded *Plato* and *Aristotle*. In making a Judgment upon the Greatness of his Performances, from the Greatness of his Reputation, one ought to consider how near to his Time those lived, whose express Relations of his Life are the oldest we have.

Diogenes Laërtius is the ancientest Author extant, that has purposely written the Life of *Pythagoras*: According to *Menagius's* Calculations, he lived in *M. Antoninus's* Time: And all that we learn from *Diogenes*, is only, that we know very little certainly about *Pythagoras*. He cites, indeed, great Numbers of Books; but those

so very disagreeing in their Relations, that a Man is confounded with their Variety. Besides, the *Græcians* magnified every Thing that they commended, so much, that it is hard to guess how far they may be believed, when they write of Men and Actions at any Distance from their own Time. *Græcia Mendax* was almost Proverbial amongst the *Romans*. But by what appears from the Accounts of the Life of *Pythagoras*, he is rather to be ranked among the Law-givers, with *Zalucus* and *Solon*, and his own two Disciples, *Zaleucus* and *Charondas*, than amongst those who really carried Learning to any considerable height. Therefore, as some other Legislators had, or pretended to have, Super-natural Assistances, that they might create a Regard for their Laws in the People to whom they gave them; so *Pythagoras* found out several Equivalents, which did him as much Service. He is said, indeed, to have lived many Years in *Egypt*, and to have conversed much with the Philosophers of the *East*; but if he invented the *XLVIIth* Proposition in the First Book of *Euclid*, which is unanimously ascribed to him by all Antiquity, one can hardly have a profound Esteem for the Mathematical Skill of his Masters. It is, indeed, a very noble Proposition,

Two (d)
very con-
siderable
Writings of
Pythagoras
his Life.

(c) 18

position, the Foundation of Trigonometry, of universal and various Use in those curious Speculations about Incommensurable Numbers; which his Disciples from him, and from them the *Platonists*, so exceedingly admired. But this shows the Infancy of Geometry in his Days, in that very Country which claims the Glory of Inventing it to her self. It is probable, indeed, that the *Egyptians* might find it out; but then we ought also to take notice, that it is the only very considerable Instance of the real Learning of *Pythagoras* that is preserved. Which is the more observable, because the *Pythagoreans* paid the greatest Respect to their Master, of any Sect whatsoever; and so we may be sure that we should have heard much more of his Learning, if much more could have been said. And though the Books of *Hermippus* and *Cratippus* (b) are lost, yet *Laërtius*, who had read them, and *Porphyry* and *Jamblichus*, Men of great Reading, and diffuse Knowledge, who, after *Diogenes*, wrote the Life of the same *Pythagoras*, would not have omitted any material Thing of that kind, if they had any where met with it. Amongst his other Journeys, *Sir William Temple* mentions *Pythagoras's* Journey (c) to *Delphi* (e). What that Voyage of his is here remembered for, it is not easy to guess.

(b) Two very considerable Writers of *Pythagoras* his Life.

(c) Pag. 15.

gues. Apollo's Priestesses are not famous
 for discovering Secrets in Natural or Ma-
 thematical Matters; and as for Moral
 Truths, they might as well be known,
 without going (to) Delphi to fetch them. (d) Vit.
Pythag.
Si 4.
Van Dalen, in his Discourses of the Heathen
 Oracles, has endeavoured to prove, that
 they were only Artifices of the Priests,
 who gave such Answers to Enquirers as
 they desired, when they had either Power
 or Wealth to back their Requests. If
Van Dalen's Hypothesis be admitted, it
 will strengthen my Notion of *Pythagoras*
 very much; since, when he did not care
 to live any longer in *Samos*, because of
Polycrates's Tyranny, and was desirous to
 establish to himself a lasting Reputation,
 for Wisdom and Learning, amongst the
 ignorant Inhabitants of *Magna Græcia*,
 where he settled upon his Retirement, he
 was willing to have them think that
Apollo was of his Side. That made him
 establish the Doctrine of Transmigration
 of Souls, which he brought with him out
 of *India*; that so those *Italians* might think
 that he had a certain Remembrance of
 Things past, since his first Stage of Life,
 and the Beginning of the World; and upon
 that Account admire him the more. For
Lucretius (d) says, that he pretended to
 remember every Thing that he had done
 formerly,

H

(e) Ibid.
§. 10.

(f) Pag.
53.

formerly, whilst he was in those other Bodies; and that he received this as an especial Favour from *Mercury*, who gave him his Choice of whatsoever he desired, except Immortality. (e) For these Reasons also he obliged his Scholars to go through a Trial of Five Years, to learn Obedience by Silence: And that afterwards it was granted to some few, as a particular Favour, to be admitted into his Presence. These Things tended very much to impress a Veneration of his Person upon his Scholars, but signified nothing to the Advancement of Learning; yea, rather hindered it. Those that live in the End of the World, (f) when every Thing, according to *Sir William Temple*, is in its Declension, know no Way so effectual to promote Learning, as much Conversation and Enquiry; and, which is more, they have no Idea how it can be promoted without them. The Learned Men of the present Age pretend to no Acquaintance with *Mercury* or *Apollo*, and can do as little in Natural Knowledge by such a Sham-Revelation, as they can by Reminiscence. If a Man should, for Five Years together, read Lectures, to one that was not allowed to make Pauses, or ask Questions; another Man, in the ordinary Road, by Books and Professors, would learn more,

at least to much better purpose, in Six Months, than he could in all that Time.

Pythagoras was, without question, a wise Man, well skill'd in the Arts of Civil Prudence; by which he appeas'd great Disturbances in those *Italian* Commonwealths. He had much more Knowledge than any Man of that Age in *Italy*, and knew how to make the most of it. He took great Delight in Arithmetical Speculations, which, as *Galileo* (g), not im- probably, guesses, he involved in Mysteries, that so ignorant People might not despise him, for busying himself in such abstruse Matters, which they could not comprehend; and if they could have comprehended, did not know to what Use to put them. He took a sure Way to have all his Studies valued, by obliging his Scholars to resign up their Understandings to his Authority and Dictates. The great Simplicity of his Manners, with the Wisdom of his Axioms and Symbols, charmed an ignorant Age, which found real Advantages, by following his peaceful Measures, much above those that were formerly procur'd by Rapin and Violence. This seems to be a true Account of *Pythagoras*, in the History of whose Reputation, there is nothing extraordinary, since Civilizers of Nations

(g) *System. Cosmic.*

have always been as much magnify'd as the Inventors of the most useful Arts: But one can no more conclude from thence, That *Pythagorus* knew as much as *Aristotle* or *Democritus*, than that *Francis Bacon* was as great a Mathematician as *Dr. Barrow*, or *Mr. Newton*, because he knew enough to be thought a Conjuror in the Age in which he lived, and no despicable Person in any other.

But it may not be amiss to give a Taste of some of the *Pythagorean* Notions; such, I mean, as they first started in *Europe*, and chiefly valued themselves upon. Of this sort, were their Arithmetical Speculations: By them they pretended to explain the Causes of Natural Things. The following Account of their Explication of Generation, is taken out of *Censorinus* and *Aristides*:

‘ Perfect Animals are generated in two distinct Periods of Time; some in Seven Months, some in Nine. Those Generations that are compleated in Seven Months, proceed in this Order: In the first Six Days after Conception, the Humour is Milky; in the next Eight it is turned into Blood; which Number 8 bears the Proportion of 1 to 6; in Nine Days more it becomes Flesh; 9 is in a Sescuple Proportion to 6; in Twelve

Twelve Days more the Embryo is form'd; 12 is double to 6: Here then are these Stages, 6, 8, 9, 12; 6 is the first perfect Number, because it is the Summ of 1, 2, 3, the only Numbers by which it can be divided. Now, if we add these Four Numbers, 6, 8, 9, 12, together, the Summ is 35; which multiply'd by 6, makes 210, the Number of Days from the Conception to the Birth; which is just Seven Months, allowing 30 Days to a Month. A like Proportion must be observed in the larger Period of Nine Months; only 10, the Summ of 1, 2, 3, 4, added together, must be added to 35, which makes 45; that multiply'd by 6, gives 270, or Nine times 30, the Number of Days in larger Births.

If these fine Notions be compar'd with Dr. Harvey's upon the same Subject, no doubt but we shall all be Converts to Sir William Temple's Opinion, and make a vast Difference between the poor Observations of these later Ages, and the sublime Flights of the Ancients.

Now, though abstracted Mathematical Theories, which cannot be relished by one that has not a tolerable Skill in Mathematicks before, might, perhaps, prudently be concealed from the Vulgar, by

the Pythagorean School; and in their stead, such grave Jargon as this imposed upon them; yet even that shews how little Knowledge of Nature they could pretend to. Men that aim at Glory, will omit no probable Methods to gain it, that lie in their Way; and solid Discoveries of a real Insight into Nature, would not only have been eternally true, but have charm'd Mankind at another Rate, than such dry sapless Notions as seem at first View to have something of Subtilty; but upon a Second Reflection, appear vain and ridiculous.

(b) Pag.
28.

From Pythagoras, I shall go on to the Ancient Sages (b), who were so learned in Natural Philosophy, that they Foretold not only Eclipses in the Heavens, but Earth-quakes at Land, and Storms at Sea, great Droughts, and great Plagues, much Plenty or much Scarcity of certain sorts of Fruits or Grain, not to mention the Magical Powers attributed to several of them, to allay Storms, to raise Gales, to appease Commotions of People, to make Plagues cease.

One of the ancientest of these was Thales: He was so deeply skill'd in Astronomy, that by the Sun's Annual Course he found out the Equinoxes and Solstices: He is said also first to have foretold Eclipses; some Geometrical Properties

ties of Scalene Triangles are ascribed to him, and challenged by *Euphorbus*. Nice we are sure they were not, because the Theorem of *Pythagoras* was not then found out.

When *Sir William Temple* extolled the Skill of these *Ancient Sages*, in foretelling Changes of Weather, he seems to have forgotten that he was in *England*, and fancied that these *Old Philosophers* were there too. The *Climates of Asia Minor*, and *Greece*, are not so various as ours; and at some stated Times of the Year, of which the recurrent Winds give them constant Warning, they are often troubled with Earthquakes, and always with violent Tempests. So that by the Conjectures that we are here able to make of the Weather at some particular Seasons, though we labour under so great Disadvantages, we may easily guess how much certainer Predictions may be made by curious Men in serener and more regular *Climates*; which will take off from that Admiration that otherwise would be paid to those profound Philosophers, even though we should allow that all those Stories which are told of their Skill, are exactly true.

Besides, there is Reason to believe that we have the Result of all the Observa-

tions of these Weather-wise Sages in *Ara-
tus's Diosema*, and *Virgil's Georgics*; such
as those upon the Smuffs of Candles, the
Croaking of Frogs, and many others quite
as notable as the English Farmer's *Living
Weather-Glass*, his *Red Cow that prick'd up
her Tail*, an Infallible Prefage of a coming
Shower.

Sir *William Temple's* Method leads me
now to consider, what Estimate ought to
be made of the Learning of those Nations,
from which he derives all the Knowledge
of these *Ancient Greeks*; I shall only there-
fore give a short Specimen of those Dis-
coveries, with which these Ancient Sages
enriched the Ages in which they lived,
as I have already done of the *Pythagoreans*,
and then proceed.

(i) Vit.
*Empedo-
clis*, S. 60.

Diogenes Laërtius informs us of *Empe-
docles's* (i) Skill in Magic, by the In-
stance of his stopping those pestilential
Vapours that annoy'd his Town of *Agri-
gentum*. He took some Asses, and flea'd
them, and hung their Hides over those
Rocks that lay open to the *Etesian* Winds,
which hindred their Passage, and so freed
the Town. He tells another Story of *De-
mocritus* (k), That he was so nice in

(k) Vit.
Democriti,
S. 42.

his Observations, that he could tell whe-
ther a Young Woman were a Virgin, by
her Looks, and could find it out, though
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he had been corrupted but the Day before; and he knew, by looking upon it, that some Goat's Milk that was brought him, was of a Black Goat that had had but one Kid.

These are Instances very seriously recorded by grave Authors of the *Magical Wisdom* of the Ancients; that is, as Sir *William Temple* defines it, of that (1) excellling Knowledge of Nature, and the various Powers and Qualities in its several Productions, and the Application of certain Agents to certain Patients, which, by Force of some peculiar Qualities, produce Effects very different from what fall under Vulgar Observation and Comprehension. (1)Pag.46.

CHAP. IX.

Of the History and Geometry of the Ancient Egyptians.

From these *Ancient Sages*, Sir *William Temple* goes to the Nations from which they received their Knowledge, which are *Egypt*, *Chaldæa*, *Arabia*, *India*, and *China*; only he seems to invert the Order, by pretending that *China* and *India* were

were the Original Fountains from which Learning still ran Westward. I shall speak of them in the Order in which I have named them; because the Claims of the *Egyptians* and *Chaldeans* having a greater Foundation in Ancient History, deserve a more particular Examination.

It must be owned, That the Learning which was in the World before the *Græcian* Times was almost wholly confined to the *Egyptians*, excepting what was amongst the *Israelites*: And whosoever does but consider how difficult it is to lay the First Foundations of any Science, be they never so small, will allow them great Commendation; which if their Advocates had been contented with, there had been an End of the Controversie. Instead of that, all that has since been added to their Foundations, has been equally challenged as originally due to them, or at least once known by them, by (m) *Olavus Borrichius*, and several others long before Sir *William Temple* wrote upon this Argument.

(m) In
Hermete
Egyptio.

Before I enter upon this Question, I shall desire that one Thing may be taken Notice of; which is, That the *Egyptians* anciently pretended to so great Exactness, that every Failure is more justly imputable to them, than to other Nations; not only

only their History was so carefully look'd after, that there was a College of Priests set up on purpose, whose chief Business it was successively to preserve the remarkable Matters of Fact that occurred in their own Ages, and transmit them undisputed to Posterity, but also, there was answerable Care taken to propagate and preserve all other Parts of useful Learning: All their Inventions in *Physic*, in *Geometry*, in *Agriculture*, in *Chymistry*, are said to have been inscribed on Pillars, which were preserved in their Temples; whereby not only the Memory of the Things themselves was less liable to be lost, but Men were farther encouraged to use their utmost Diligence in making Discoveries that might be of Publick Advantage, when they were certain of getting Immortality by these Inventions. This generous Custom was the more to be applauded, because every Man was confined to one particular Part of Learning, as his chief Business; that so nothing might escape them. One was Physician for the *Eyes*, another for the *Heart*, a third for the *Head* in general, a fourth for *Chirurgical* Applications, a fifth for *Womens Diseases*, and so forth. *Anatomy*, we are told, was so very much cultivated by the Kings of *Ægypt*, that they particularly ordered the Bodies of dead

dead Men to be opened, that so Physic might be equally perfect in all its parts. Where such Care has been used, proportionable Progresses may be expected; and the World has a Right to make a Judgment, not only according to what is now to be found, but according to what might have been found, if these Accounts had been strictly true.

In the first Place therefore, we may observe, That *the Civil History of Egypt* is as lamely and as fabulously recorded, as of any Nation in the Universe: And yet the *Egyptians* took more than ordinary Care to pay all possible Honours to the Dead, especially their Kings; by preserving their Bodies with Bitumen and resinous Drugs, and by building sumptuous Monuments to lay them in: This certainly was done to perpetuate their Memories, as well as to pay them Respect: It was at least as Ancient as *Joseph's* time (n); how much older we know not. The *Jews*, who for another and a more sacred Reason, took Care of their Dead, took equal Care to preserve their Genealogies, and to draw an Uniform Thread of their History from *Abraham*, down to the Destruction of the Second Temple. Herein they acted consistently, and their History is a standing Instance of this their Care; whereas the

Egyptian

(n) Gen.
50. 2.

Egyptian History is so very inconsistent a Business, that it is impossible to make a coherent Story out of it: Not for Want of Materials, but because their Materials neither agree with themselves, nor with the History of any other Nation in the World.

A more certain Proof of the Deficiency of the *Egyptian* History cannot be produced, than that the *Time of the building of the Pyramids* was lost when *Herodotus* was in *Egypt*; as also the *Ara* of the only great Conqueror of that Nation, *Sesostris*. The first of these is not slightly to be passed over. Such vast Fabricks could not be raised without Numbers of Hands, and a great Expence of Time and Money, or something equivalent. The *Traditions* of their *Erection* are indeed minutely enough set down in *Herodotus*, but then they are set down as *Traditions*; and, which is more, they are solely to be found in him, though he is not the only ancient Writer that mentions the *Pyramids*; he only names *Cheops* and *Mycerinus*, who are differently named by other Historians; and the *Time* when they lived, is as little agreed upon, as the Names by which they are called. The History of a Nation can sure be worth very little, that could not preserve the Memory of the Names

Names at least, if not the Time, of those Princes, who were at so much Pains to be remembred, in a Place where their Monuments were so visible, that no Person could sail up and down the Nile, to or from their Capital City *Memphis*, without taking notice of them; and every Man, upon his first seeing of them, would naturally ask, what they were, by whom, and for what Intent erected. To which we may add, That these very Buildings are more exactly described in Mr. *Greaves's Pyramidographia*, than in any ancient Author now extant.

(o) In Canon Chronico.

The Difficulty of determining the Age when *Sesostris* lived, is another Instance of the Carelesness of the *Ægyptian* Historians. Either he was the same with *Sheshak*, who Invaded *Judæa* in *Rehoboam's* Time, (as Sir *John Marsham* (o) asserts after *Josephus*) or not: If he was, his Time is known indeed; but then the Authority of *Manetho*, and of those Pillars from which *Manetho* pretended to transcribe the Tables of the several Dynasties of the *Ægyptian* Kings, is at an End: Besides, it contradicts all the *Greek* Writers that mention *Sesostris*, who place him in their fabulous Age, and generally affirm, that he lived before the Expedition of the *Argonauts*, which preceded the

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the War of *Troy*. If he was not that *Shephak*, then the Time when the only famous Conqueror of the *Egyptian* Nation lived is uncertain, and all that they know of him is, that once upon a time there was a mighty King in *Egypt*, who conquer'd *Ethiopia*, *Arabia*, *Affyria*, and up to *Colchis*, with *Asia the Less*, and the Islands of the *Egean* Sea, where having left Marks of his Power, he returned home again to reap the Fruits of his Labours: A Tradition which might have been preserved without setting up a College at *Heliopolis* for that purpose.

The very Learned Mr. *Dodwell*, in his Discourse concerning the *Phœnician History of Sanchoniathon*, advances a Notion which may help to give a very probable Account of those vast Antiquities of the *Egyptians* pretended to by *Manetho*. He thinks that after the History of *Moses* was translated into *Greek*, and so made common to the Learned Men of the neighbouring Nations, that they endeavoured to rival them by pretended Antiquities of their own, that so they might not seem to come behind a People, who till then had been so obscure. This, though particularly applied by that Excellent Person to *Sanchoniathon's History*, seems equally forcible in the present Controversie. For

Manetho

Manetho dedicated his History to *Ptolemy Philadelphus*, at whose Command it was written, and wrote it about the Time that the LXXII Interpreters translated the *Pentateuch*. The great Intercourse which the *Egyptians* and *Israelites* formerly had each with other, made up a considerable part of that Book, and occasion'd its being the more taken notice of; so that this History being injurious to the vain Pretences of that People, might very probably provoke some that were jealous for the Honour of their Nation, and *Manetho* among the rest, to set up an Anti-History to that of *Moses*; and to dedicate it to the same Prince who employ'd the *Jews* to translate the *Pentateuch*, and who ordered *Manetho* himself to bring him in an Account of the *Egyptian* Antiquities, that so any Prejudices which *Ptolemy*, who was of another Nation himself, might entertain against their Country, might be effectually removed.

This Notion is the more probable in our Case, because it equally holds, whether we follow *Sir John Marsham's* Accounts, who has made the *Egyptian* Antiquities intelligible; or whether they are left in the same Confusion that they were in before. That most Learned Gentleman has reduced the wild Heap of *Egyptian* Dynasties

Dynasties into as narrow a Compass as the History of *Moses*, according to the Hebrew Account, by the help of a Table of the *Theban* Kings, which he found under *Eratosthenes's* Name, in the Chronography of *Syncellus*. For, by that Table, he (1.) Distinguished the Fabulous and Mystical part of the *Ægyptian* History, from that which seems to look like Matter of Fact. (2.) He reduced the Dynasties into Collateral Families, reigning at the same time, in several Parts of the Country; which, as some Learned Men saw before, was the only Way to make those Antiquities consistent with themselves, which till then were confused and incoherent. But it seems evident, by the Remains that we have of *Manetho* in *Eusebius*, and by the Accounts which we have of the *Ægyptian* History in *Josephus's* Books against *Appion*, and in the Ancient Christian Writers, that the *Ægyptians* in *Ptolemee's* Time did not intend to confine themselves within the Limits set by *Moses*, but resolved to go many Thousand Years beyond them. If therefore *Eratosthenes's* Table be genuine, not only *Manetho's* Authority sinks, but the Pillars from whence he transcribed his Tables of the Kings of their several Dynasties are Impostures, since they pretend to give successive Ta-

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bles of vast Numbers of Kings reigning in several Families, for many Ages ; which ought to be contracted into a Period of Time, not much exceeding MM Years. If the Table of *Erasthenes* be not the true Rule by which the *Aegyptian* Antiquities are to be squared, then the former Prejudices will return in full force ; and one cannot value *Tables*, and *Pillars*, and *Priests*, that could not fix the *Time* of the *Erection* of the *Pyramids*, and the *Age* of *Sesostris*, so certainly, as that when *Hierodotus* was in the Country, they might have been able to inform him a little better than they did.

This long Enquiry into the *Aegyptian* History, will not, I hope, be thought altogether a Digression from my Subject, because it weakens the *Aegyptians* Credit in a most sensible Part : For, if their Civil History is proved to be egregiously fabulous, or inconsistent, there will be no great reason to value their mighty Boasts in any thing else ; at least, not to believe them upon their own Words, without other Evidence.

In *Geometry*, the *Aegyptians* are, of all hands, allowed to have laid the first Foundations : The Question therefore is, How far they went ? Before this can be answer'd satisfactorily, one ought to enquire whether

whether *Pythagoras* and *Thales*, who went such long Voyages to get Knowledge, would not have learn'd all that the *Egyptians* could teach them? Or, whether the *Egyptians* would willingly impart all they knew? The former, I suppose, no body questions: For the latter, we are to distinguish between Things that are concealed out of Interest, and between other Things, which, for the same Interest, are usually made public. The *Secrets of the Egyptian Theology* were not proper to be discovered, because by those Mysteries they kept the People in awe: The *Philosopher's Stone* likewise, if they had been Masters of it, might, for Gain, have been concealed: And *Medicinal Arcana* are of Advantage often-times to the Possessors, chiefly because they are *Arcana*. But *Abstracted Mathematical Theories*, which bring Glory to the Inventors, when they are communicated to those that can relish them, and which bring no Profit when they are locked up, are never concealed from such as shew a Desire to learn them; provided that by such a Discovery the first Inventors are not deprived of the Glory of their Inventions; which is encreased by publishing, if they have before-hand taken care to secure their Right. So that since *Pythagoras* is commended for no

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famous Invention in Geometry, except the XLVIIth Proposition of the First Book of *Euclid*: And since, *Thales* is said to have sacrificed an Oxe, for finding out how to inscribe a Rectangled Triangle within a Circle, which implies, that he learn'd it not of the *Ægyptians*, we may reasonably conclude, that these two *Græcian* Philosophers brought nothing of more Moment, in that Way, with them, out of *Ægypt*; and therefore, either the farther Discoveries that were made in Geometry, were made by the *Ægyptians* afterwards; or, which is more probable, they were *Græcian* Superstructures upon *Ægyptian* Foundations. Besides, though a Man travelled into *Ægypt*, yet it does not follow from thence, that he learn'd all his Knowledge there. Though *Archimedes* and *Euclid* were in *Ægypt*, yet they might, for all that, have been Inventors themselves of those noble Theorems which are in their Writings. In *Archimedes's* Time, the *Greeks* were settled in *Alexandria*, under the *Ptolemee's*, who were then, and long before, Lords of *Ægypt*; and the Learning of *Ægypt*, at that Time, could no more be attributed to those Old *Ægyptians*, who lived before the *Græcian* Conquest, than the Learning of Archbishop *Usher*, Sir *James Ware*, and Mr. *Dodwell*,
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can be attributed to a Succession of those Learned *Irish-men* who were so considerable in the *Saxon* Times.

This last Consideration is of very great Moment ; for few of the *Greeks*, after *Plato*, went into *Egypt* purely for Knowledge : And though *Plato* brought several of his Notions out of *Egypt*, which he interwove into his Philosophy, yet the Philosophers of the *Alexandrian* School, who, for the most part, were *Platonists*, shew, by their Way of Writing, and by their frequent Citations out of *Plato's* Books, that they chose to take those Things from the *Græcians*, which, one would think, might have been had nearer Home, if they had been of the Original Growth of the Countrey. The most considerable Propositions in *Euclid's Elements* were attributed to the *Greeks* ; and we have nothing confessedly *Egyptian*, to oppose to the Writings of *Archimedes*, *Apollonius Pergæus*, or *Diophantus* : Whereas, had there been any Thing considerable, it would most certainly have been produced, or, at least, hinted at, by some of those very Learned *Egyptians*, or rather later *Greeks* born in *Egypt*, whose Writings that treat of the Extent of the *Egyptian* Knowledge, are still extant.

Having now examined the *History* and *Geometry* of the *Egyptians*, it will be much easier to go through their Pretences, (or rather the Pretences of their Advocates) to Superiority in other Parts of Learning. The *Egyptians* seem to have verified the Proverb, *That he that has but one Eye, is a Prince among those that have none.* This was Glory enough; for it is always exceedingly Honourable to be the First, where the Strife is concerning Things which are worth contending for.

CHAP. X.

Of the Natural Philosophy, Medicine and Alchemy of the Ancient Egyptians.

THE *Egyptian Natural Philosophy* and *Physic* shall be joined together, because there is so great an Affinity between them, that true Notions in either Science assist the other. Their *Physic*, indeed, was very famous in *Homer's Time*; and wonderful Things are told of *Hermes*, the pretended Father of the *Chimical Art*. But one ought to distinguish between

between Particular Medicines, how noble soever, and General Theories founded upon a due Examination of the Nature of those Bodies from whence such Medicines are drawn, and of the Constitution and Fabrick of the Bodies of the Patients to whom they are to be applied, and of the incidental Circumstances of Time and Place; which are necessary to be taken in by a wise Physician. The Stories of the *West-Indian* Medicines are many of them very astonishing, and those Salvages knew perfectly how to use them before ever the *Europeans* came among them, and yet they were never esteemed able Physicians. This Instance is applicable to the present Question: *Galen* often mentions *Egyptian* Remedies, in his Treatises of *Medicines*, which are numerous and large, though he seldom mentions any of their Hypotheses, from which only a Man can judge whether the *Egyptians* were well-grounded Physicians, or Empiricks. This is the more remarkable, because *Galen* had lived long at *Alexandria*, and commends the Industry of the *Alexandrians* in cultivating Anatomy, which is so necessary a Part of a Physician's Business.

In General therefore we may find, that all the *Egyptian Notions of Physical Mat-*
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ters were built upon *Astrological and Magical Grounds*: Either the Influence of a Particular Planet, or of some Tutelar Dæmon, were still considered. These Foundations are precarious and impious, and they put a stop to any Encrease of real Knowledge, which might be made upon other Principles. He that minds the Position of the Stars, or invokes the Aid of a Dæmon, will rarely be solicitous to examine nicely into the Nature of his Remedies, or the Constitution of his Patients, without which, none of the ancient Rational Physicians believed that any Man could arrive at a perfect Knowledge of their Art. So that if *Hippocrates* learn'd his Skill in *Ægypt*, as it is pretended, the *Ægyptian* Physicians afterwards took a very stupid Method to run so far upon Imaginary Scents, as even to lose the Memory that they had ever pursued more Rational Methods. Those that would be further satisfy'd of the Truth of this Matter of Fact, may find it abundantly proved in *Conringius's* Discourse (p) of the Old *Ægyptian* Medicine.

(p) *De Hermetica Ægyptiorum vetere & Paracelsicorum nova Medicinâ.*

But we are told, that there was a particular sort of *Physic*, used only amongst the *Ægyptian Priests*, which was kept secret, not only from the *Greeks* that came into their Country for Knowledge, but from

from the Generality of the Natives themselves; wherein, by the help of the *Grand-Elixir*, they could do almost any thing but restore Life to the Dead. This *Elixir*, which was a Medicine made with the Philosophers-Stone, was a Chymical Preparation; and, if we may believe *Olaus Borrichius* (q), the Great and Learned Advocate of the Chymical and Adept Philosophers, was the Invention of *Hermes*, who was Contemporary with *Isis* and *Osiris*, whose Age none ever yet determined. If these Claims are true, there is no question but the *Aegyptians* understood Nature, at least that of Metals, in a very high degree. This is an Application of Agents, to Patients (r); which, if made good, will go farther than any Assertion commonly brought to prove the Extent of *Aegyptian* Knowledge: And therefore, I presume, I shall not be thought tedious, if I enlarge more particularly upon this Question, than I have done upon the rest; especially since there has not been, that I know of, any direct Answer ever printed to *Borrichius's* Book upon this Argument, which he wrote against the foremention'd Discourse of *Conringius*.

(q) De Ortu & Progressu
Chemia; as also *Hermetis*
Aegyptiorum & Chemicorum
sapientia ab Herm.
Conringii Animadversioni-
bus vindicata.

(r) Pag.

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One may justly wonder that there should have been so noble an Art as that of turning baser Metals into Gold and Silver so long in the World, and yet that there should be so very little, if any thing, said of it in the Writings of the Ancients. To remove this Prejudice therefore, all the fabulous Stories of the *Greeks*, have, by Men of fertile Inventions, been given out to be disguised Chymical *Arcana*. *Jason's Golden Fleece*, which he brought from *Colchis*, was only a Receipt to make the *Philosopher's Stone*; and *Medea* restored her Father-in-Law, *Aeson*, to his Youth again by the *Grand Elixir*. *Borrichius* is very confident that the *Aegyptian Kings* built the *Pyramids* with the Treasures that their Furnaces afforded them; since, if there were so many Thousand Talents expended in Leeks and Onions, as *Herodotus* tells us there were, which must needs have been an inconsiderable Summ, in comparison of the whole Expence of the Work, one cannot imagine how they could have raised Money enough to defray the Charge of the Work any other Way. And since *Borrichius*, *Jacobus Tollius* has set out a Book called *Fortuita*, wherein he makes most of the Mythology to be Chymical Secrets.

But though *Borrichius* may believe that he can find some obscure Hints of this *Great Work* in the Heathen Mythologists, and in some scatter'd Verses of the Ancient Poets, which, according to him, they themselves did not fully understand when they wrote them; yet this is certain, That the ancientest Chymical Writers now extant, cannot be proved to have been so old as the Age of *Augustus*. *Conringius* believes that *Zosimus Panopolita* is the oldest Chymical Author that we have, whom he sets lower than *Constantine the Great*. That perhaps may be a Mistake; for *Borrichius*, who had read them both in MS. in the *French King's Library*, brings very plausible Arguments to prove that *Olympiodorus*, who wrote Commentaries upon some of the Chymical Discourses of *Zosimus*, was \overline{CL} Years older than *Constantine*; because he mentions the *Alexandrian Library* in the Temple of *Serapis*, as actually in being, which, in *Ammianus Marcellinus's* Time, who was Contemporary with *Julian the Apostate*, was only talk'd of, as a thing destroyed long before. I don't mean that which was burnt in *Julius Cæsar's* Time, but one afterwards erected out of the scatter'd Remains that were saved from that great Conflagration, which is mentioned by *Tertullian*,

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Tertullian, under the Name of *Ptolemy's* Library at *Alexandria*. If this *Zosimus* is the same whom *Galen* mentions, for a Remedy for Sore Eyes, in his IVth. Book of *Topical Medicines*, then both he and *Olympiodorus* might have been considerably older, and yet have lived since our Blessed Saviour's Time. However, be their Age what it will, they wrote to themselves, and their Art was as little known afterwards as it was before: *Julius Firmicus* is the First Author that has mention'd *Alchemy*, either by Name, or by an undisputed Circumlocution; and he dedicated his Book of *Astrology* to *Constantine the Great*. *Manilius* indeed (who is suppos'd to have liv'd in *Augustus's* Time) in the IVth. Book of his *Astronomicon*, where he gives an Account of those that are born under *Capricorn*, has these words,

————— *scrutari cæca metalla,*
Depositas & opes, terræque exurere venas,
Materiemque manu certâ duplicarier arte:

which last Verse seems to be a Description of *Alchemy*: But, besides that the Verse is suspected to be spurious; even the Age of *Manilius* himself is not without Controversie; some making him Contemporary with the Younger *Theodosius*, and

and consequently later than *Firmicus* himself. We may expect to have this Question determined, when my most Learned Friend, Dr. Bentley, shall oblige the World with his *Censures* and *Emendations* of that Elegant Poet.

But if these *Græcian* Chymists should have the utmost Antiquity allowed them that *Borrichius* desires, it would signify little to deduce their Art from *Hermes*; since Men might pretend that their Art was derived from him in *Zosimus's* Days, and yet come several Thousand Years short of it, if we follow the Accounts of *Manetho*. Wherefore, though this is but a Negative Argument, yet it seems to be unanswerable; because if there had been such an Art, some of the *Greeks* and *Romans*, who were successively Masters of *Egypt*, would have mention'd it, at least, before *Zosimus's* Time. Such a Notice, whether with Approbation, or Contempt, had been sufficient to ascertain the Reality of such a Tradition. *Tacitus* (s) tells us, (s) *Annal.* that *Nero* sent into *Africa* to find some Lib. XVI. Gold, that was pretended to be hid under Ground: This would have been an excellent Opportunity for him to have examined into this Tradition, or to have punished those, who either falsely pretended to an Art which they had not, or would

(r) Nat.
Hist. Lib.
XXXIII.
cap. 1, 2,
3, 4.

would not discover the true Secret, which, in his Opinion, would have been equally criminal; and had *Nero* done it, *Pliny* would have told us of it, who was very inquisitive to collect all the Stories he could find of every thing that he treats about, whereof Gold (a) is one that is not slightly passed over; and besides, he never omits a Story because it appears strange and incredible, if we may judge of what he has left out, by what he has put in, but often ranges the wonderful Qualities of Natural Bodies under distinct Heads, that they might be the more observed.

(u) Herm.
Aegypt.

To evade the Force of this Argument, *Borrichius* (u) says that the *Egyptians* were afraid of their Conquerors, and therefore industriously concealed their Art. But there is a wide Difference between concealing the Rules and Precepts of an Art, and concealing the Memory that ever there was such an Art. If it was ever known before the *Persian* Conquest, as by his Account of the Erection of the Pyramids, which were built many Ages before *Cambyse's* Time, it is plain he believes it was, though we should allow it to have been in few Hands, it is not credible that this Art of Making Gold should never have been pretended

to before *Diocletian's* Time, who is reported by *Suidas* to have burnt great Numbers of Chymical Books, which gave an Account of the Process. Whereas afterwards, every now and then, Footsteps of cheating *Alchemists* are to be met with in the *Byzantine* Historians. It was not possible to pretend to greater Secrecy in the Manner of their Operations, than is now to be found in all the Writings of Modern *Adept Philosophers* (as they call themselves.) And yet these Men, who will not reveal their Process, would think themselves affronted, if any Man should question the real Existence of their Art.

But the Hypothesis of those who find Chymical Secrets in *Homer*, *Virgil*, and the rest of the ancient Poets, is liable to several Exceptions taken notice of neither by *Comringius* nor *Borrichius*.

(1.) They say, that when *Jason* heard that the King of *Colchis* had a Book written upon a Ram's skin, wherein was the Process of the Philosophers-Stone, he went with the *Argonauts* to fetch it. Here it may be objected, (1.) That it is not likely that *Sesostris*, who conquer'd *Colchis*, would ever suffer the *Egyptian* Priests to reveal such a Secret to that conquered People. *Diocletian*, according to them, burnt

burnt all the Chymical Books that he could find in *Egypt*, that the *Egyptians* might not rebel, when they were deprived of that Fund, which supported their Wars. And *Borrichius* supposes that the *Egyptian* Priests used this Art chiefly to supply the Expences of their Kings. (2.) How came *Jason* and the *Argonauts* not to grow richer by this Fleece? It cannot be pretended that it was concealed from them, upon the Account of its being (like the Books of the Modern *Adepts*) written in so obscure a Stile, that it was unintelligible for want of a Master; since *Medea* was with *Jason*, who had the Secret, what or how great soever it was. (3.) Since the *Græcians* were not tied to Secrecy, how came their Traditions to be so obscure, that those Passages in *Apollonius Rhodius's Argonautics* which are supposed to be meant of the *Grand Elixir*, were never applied to a Chymical Sense, till the Writings of *Synefius*, *Zosimus*, and the other old *Græcian* Chymists appeared? Especially since, (4.) *Apollonius Rhodius* himself was an *Alexandrian Greek*, born in *Egypt*, and so could easily acquaint himself with the Traditions of that Country, which he, originally of another Nation, was under no Obligation to conceal.

(2.) The

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(2.) The Chymists, at least *Bornichius* for them, own *Democritus's* Books to be genuine, upon the Credit of *Zosimus* who quotes them: If they are, this pretended Secrecy falls to the ground: For *Democritus* affirms, That he learn'd his Art from *Oristes* a *Mede*, who was sent by the Kings of *Persia* into *Egypt*, as Governor of the *Egyptian* Priests. Then the Secret was divulged to some of the Conquerors of their Countrey. If so, why no more Tradition of it? If not the Process it self, yet at least the Memory that once there was such a Process: Which would have been enough for this Purpose. The same Question may be asked of *Democritus*, to whom *Oristes* revealed it. This will weaken *Zosimus's* Credit as an Antiquary, upon whose Assertion most of this pretended Antiquity is founded. Since at the same time that he objects the Secrecy of the Ancient *Egyptian* Priests, as a Reason why the Memory of this Art was so little known, he owns himself obliged to a *Greek*, who had it from the *Egyptians* at Second Hand.

But how will these Pretenders to remote Antiquity, who tell us, that *Moses*, by his Skill in Chymistry, ground the Golden Calf to Powder, reconcile a Pas-

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(w) Lib.
de Lapi-
dis.

said in *Theophrastus* to their Pretension?
He, speaking of Quick-silver (w), says that
the Art of Extracting it from *Cinnabar*
was not known till 33 Years before his
Time, when it was first found out by
Gallianan Athenian. Can we think that
the *Egyptians* could hinder these *Greeks*
to be *Greeks*, who said so long in their
Country, from knowing that there was
such a Metal as *Mercury*? Or could these
Egyptians make Gold without it? If they
could, they might reasonably suppose that
the *Israelites* could make Bricks without
Soddy, since they could make Gold and
Silver without that, which Modern *Adepts*
affirm to be the Seed of all Metals. In *Theo-
phrastus*'s Words are too general, to ad-
mit of any Objection, as if he believed
that *Callias*'s Intention ought to be li-
mited to his own Country. This, joined
to the great Silence of the Ancients (espe-
cially *Herodotus* and *Diodorus Siculus*,
who dwell so long upon the *Egyptian*
Arts and Learning) concerning most of
the wonderful Phenomena of that extra-
vagant Metal, plainly shews that there
were no Traditions of such mighty things
to be done by it, as the *Alchymists*'s Books
are full of. *Bottichius* therefore recurs
to his old Subterfuge, *Egyptian Secrecy*,
and finds some doubtful at least, if not
fabulous,

fabulous, Stories of *Dædalus* and *Icarus*, and the Poetical Age, which he opposes to the positive Testimony of *Theophrastus*. Perhaps my urging the late Discovery of *Mercury*, may be thought to be begging the Question, since some who have written of the Philosophers-Stone, have taught that their *Mercury* has no Affinity with common *Mercury*: Which has led many Persons to try several extravagant Processes to find it out. But *Eireneus Philalates*, who is look'd upon as one of the clearest Writers that has ever written upon this Subject, says expressly, that (x) Natural Mercury Philosophically prepared, is the Philosophical Menstruum, and the Dissolvent Mercury.

(x) *Enarratio Methodica trium Gebri Medicinarum*, p. 18.

After so long an Enquiry into the Antiquity of this Art of Transmuting Metals, it will be asked perhaps, what may be thought of the Art it self. I must needs say, I cannot tell what Judgment to make of it: The Pretences to Inspiration, and that Enthusiastic Cant which run through the Writings of almost all the *Alchymists*, seem so like Imposture, that one would be tempted to think that it was only a Design carried on from Age to Age, to delude Mankind; and it is not ealie to imagine why God should hear the Prayers of those that desire to be Rich. If, as

they pretend, it was Zeal for the Good of Mankind that made them take such Pains to find out such noble Medicines as should free Men from the most obstinate Diseases to which our Natures are subject, why do they not communicate them, and leave the Process in Writing plainly to Posterity, if they are afraid of Danger for themselves? Concern for the Welfare of Mankind, and affected Secrecy, seem here inconsistent Things: Men of such mortified Tempers, and public Spirits, ought not to be concerned, though Gold or Silver were made as common as Lead or Tin, provided that the *Elixir* which should remove all Diseases were once known.

Though these are reasonable Prejudices against the Belief of the Truth of this Operation, yet one can hardly tell how to contradict a Tradition so general, and so very well attested (y).

(y) Vid. *Borrichium de Ortu & Progressu Chymie, & Morbosii Epistolam de Transmutatione Metallorum ad Joëlem Langelottum.*

So many Men, methinks, could not have cheated the World successfully for so many Ages, if some had not been sincere: And, to use a Proverb in their

own way, *So much Smoak could scarce have lasted so long without some Fire.* Till the Seminal Principles from which Metals are compounded are perfectly known, the

the Possibility of the Operation cannot be disproved : Which Principles, as all other Real Essences of Things, are concealed from us. But as a wise Man cannot, perhaps, without Rashness disbelieve what is so confidently asserted, so he ought not to spend much Time and Cost about Trying whether it will succeed, till some of the *Adepti* shall be so kind as to give him the Receipt.

By what has been said, it is evident, what Opinion one ought to have of the Chymical Skill of the Ancient *Egyptians* : Though it is most probable that the Art owes its Original to them from whom it receives its Name : But this Original is much too late to do Sir *William Temple's* Hypothesis any Service.

But it is high time to leave the *Egyptian Physic*, and therefore I shall only add One or Two Instances of their Skill in Anatomy, and so pass on. *Gellius* (z) and *Macrobius* (a) observe ; the one from *Appian*, who wrote of the *Egyptians* ; the other from the *Egyptian Priests* themselves, that there is a particular Nerve that goes from the Heart to the Little-Finger of the Left-Hand, for which Reason they always wore Rings upon that Finger ; and the Priests dipped that Finger in their perfumed Ointments : This be-

(z) *Noct. Attic. Lib. X. cap. 10.*

(a) *Saturnal. l. 7. cap. 13.*

(b) *Herm.*
Egypt.
Presat.

(c) *Hist.*
Nat. lib. xi.
cap. 37.

(d) *De Die*
Natali. cap.
17.

ing ridiculed by *Conringius*, *Borrichius* (b) assures us, that he always found something to countenance this Observation, upon cutting of his Nails to the quick. *Pliny* (c) and *Causorinus* (d) give this following Reason from *Dioscorides* the Astrologer, why a Man cannot live above a Hundred Years, because the *Alexandrian* Embalmers observed a constant Encrease and Diminution of Weight of the Hearts of those sound Persons whom they opened, whereby they judged of their Age. They found that the Hearts of Infants of a Year old weighed two Drachms, and this Weight encreased Annually by two Drachms Every Year, till Men came to the Age of Fifty Years: At which time they as gradually decreased till they came to an Hundred, when, for want of a Heart, they must necessarily die.

To these Two Instances of the Criticalness of *Egyptian Anatomy*, I shall add one of their Curiosity in *Natural Enquiries*, and that is, their Knowledge of the Cause of the Annual Overflowing of the Nile. This, which was the constant Wonder of the Old World, was a Phenomenon seldom over-looked by the *Greek Philosophers*: Seven of whose Opinions are reckoned up by *Plutarch*, in the First Chapter of the Fourth Book of his *Opinions of the Philosophers*.

Isophras. If Curiosity Generally attends a Desire of Knowledge, and grows along with it, then the *Egyptian* Priests were inexorably negligent, that they did not very early know that the Swelling of the Nile proceeded from the Rains that fell in *Ethiopia*, which raising the River at certain Seasons, made that Overflowing of the Flats of *Egypt*. One would think that in *Sesostri's* Time the *Egyptian* Priests had Access enough into *Ethiopia*; and whoever had once been in that Countrey, could have resolved that Problem, without any Philosophy. It was known indeed in *Plato's* Time, for then the Priests told it to *Endorus*; but *Thales*, *Democritus*, and *Herodotus*, who had all enquired of the *Egyptians*, give such uncouth Reasons, as shew that they only spoke by guess. *Thales* thinks that the *Etesian* Winds blew at that Time of the Year against the Mouths of the River, so that the fresh Water finding no Vent, was beaten back upon the Land. *Democritus* supposes that the Northern Snows being melted by the Summer Heats, are drawn up in Vapours into the Air; which Vapours circulating towards the South, are, by the Coldness of the *Etesian* Winds, condensed into Rain, by which the Nile is raised. *Herodotus* thinks that an equal

Quantity of Water comes from the Fountains in Summer and Winter, only in Summer there are greater Quantities of Water drawn up by the Sun, and in Winter less, and so by consequence all that time it overflowed. Democritus's Opinion of the *Phaenomenon* seems not amiss, though his Hypothesis of the Cause of it is wrong in all probability; yet it is plain, That *Plutarch* did not believe it to be the same with that which the *Egyptian* Priests gave to *Eudoxus*, which is the only true one, because he sets them both down apart. The Cause of this wonderful *Phaenomenon* could not be pretended to be a Secret; no Honour could be got by concealing a Thing, the pretended Ignorance whereof was rather a Disgrace. Those *Egyptian* Priests, whose Business it was to gather Knowledge, must have had an extraordinary Love for a Sedentary Life, or have been averse to inform themselves from others, more than the rest of Mankind, who would not be at the Pains either to learn what *Sesostris's* Soldiers could have told them, or to go CC or CCG Miles Southward to search for that, which they must certainly have often reasoned about, if they were such Philosophers as they pretended to be.

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Nay, by the Curiosity of the *Greeks*, we are sure they did *reason about* it; they thought it as much a Wonder as we can do now; rather more, because they knew of no other Rivers that overflow at periodical Seasons like it, as some are now known to do in other Parts of *Africa*, and the *East-Indies*.

Upon the whole Matter, after a particular Search into the whole Extent of *Egyptian* Learning, there seems to be no Reason to give the *Egyptians* the Pre-eminence in point of Knowledge above all Mankind. However, considering the great Labour which is requisite to form the First Notions of any part of Learning, they deserve great Applause for what they discovered, and ought to have proportionable Grains of Allowance for what they left unfinished; Wherefore, when the Holy Scriptures (e) assure us, that (e) *Moses* was skill'd in all the Learning of the *Egyptians*, they give him the greatest Character for Humane Knowledge that could then be given to any Man. The *Egyptian* Performances in Architecture were exceedingly wonderful, (f) and the (f) *Hadrian* the Emperor gives them, that they found Employments for all sorts of Persons, the Blind, the Lame, the Gouty, as well as the Strong

vol. 1 (3)
X. di. I

vol. 1 (4)
X. di. I

(e) *Acts*
vii. 22.

(f) *Vid.*
Herodoti
Europen.

Strong and Healthy, shews that it was natural to the *Egyptians* to be always busied about something useful. The Art of Brewing Mault-Drinks was long ago ascribed (g) to the *Egyptians* as the first Inventors, for which these Northern Nations are not a little beholding to them. Their Laws have, by those who have taken the greatest Pains (h) to destroy the Reputation of their Learning in other things, been acknowledged to be very wise, and worth going so far as *Pythagoras*, *Solon* and *Lycurgus* did to fetch them. So that if their Modern Advocates had extolled their Learning with any other Design than that of Disparaging the Knowledge of the present Age, there would have been no Reason to oppose their Assertions.

(g) *Hero-*
dotus : Co-
lumella,
Lib. X.

(h) *Conrin-*
gus in Me-
dicinâ Her-
meticâ.

(c) *Ad-*
mir.

(d) *Ad-*
mir.
Herodotus
Excerpt.

CHAP. I.
Of the Learning of the Egyptians, they give him the greatest Honour for Humane Knowledge that could then be given to any Man. The Egyptian Performances in Architecture were exceedingly wonderful, (v) and the Character which Warton the Emperor gives them, that they found Employments for all sorts of Persons, the Blind, the lame, the Gouty, as well as the Strong

CHAP. XI.

Of the Learning of the Ancient Chaldeans and Arabians.

THE Chaldeans and the Arabs are the People that lie next in Sir William Temple's Road. Though it is not easy to separate what is Fabulous from what is Genuine in the Antiquities of these Nations, yet we may pronounce with some Certainty,

(1.) That the Chaldean Astronomy could not be very valuable, since, as we know from Vitruvius, and others, they had not discovered that the Moon is an Opaque Body. For which Reasons, possibly, with several others, some of their Learnedest Champions have confessed, that they believed that the Ancient Chaldean Observations, were rather Registers of the Phenomena of Heavenly Bodies, after they had appeared, than Predictions of their future Appearance. Whether their Astronomical Observations were older than their Monarchy, is uncertain: If they were not, then in Alexander the Great's Time they could not challenge an Antiquity of above \overline{D} or \overline{DC} Years.

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mention *Alexander*, because he is said to have sent vast Numbers of Observations from *Babylon*, to his Master *Aristotle*. The *Assyrian* Monarchy, of which the *Chaldean* might not improperly be called a Branch, pretends, indeed, to great Antiquity: Mighty Things are told of *Ninus* and *Semiramis*, who is more than once mentioned by Sir *William Temple*, in these *Essays*, for her Victories, and her Skill in Gardening. But these Accounts are, very probably fabulous, for the following Reasons.

Till the Time of *Tiglath-Pileser* and *Pul*, we hear no News of any *Assyrian* Monarchs in the *Jewish* History. In *Amrappel's* Time, who was overthrown by *Abraham* and his Family, in the Vale of *Siddim*, the Kings of *Chaldea* seem to have been no other than those of *Canaan*, Captains of *Hords*, or Heads of *Claus*. And *Amrappel* was Tributary to *Chedor-laomer* King of *Elam*, whose Kingdom lay to the East of *Babylon*, beyond the River *Tigris*. *Chusshan Rishathaim*, King of *Mesopotamia*, who was overthrown some Ages after by *Othniel* the *Israelitish* Judge, does not seem to have been a powerful Prince: It may be said, indeed, that he was General to some *Assyrian* Monarch; but that is begging the Question,

tion, since there is nothing which can favour such an Assertion in the Book of Judges.

But when the *Affyrians* and *Babylonians* come once to be mentioned in the *Jewish History*, they occur in almost every Page of the *Old Testament*. There are frequent Accounts of *Pul*, *Tiglath-Pileser*, *Shalmanezzer*, *Sennacherib*, *Esar-baddon*, *Nebuchadnezzar*, *Evil-merodach*, *Belsazzar*; and who not? But these Kings lived within a narrow Compass of Time; the oldest of them but a few Ages before *Cyrus*. This would not suit with that prodigious Antiquity which they challenged to themselves. The Truth is, *Herodotus*, who knew nothing of the Matter, being silent, *Ctesias* draws up a new Scheme of History much more pompous; and from him, or rather, perhaps, from *Berosus*, who was Contemporary with *Manetho*, and seems to have carried on the same Design for *Chaldæa*, which *Manetho* undertook for *Egypt*, *Diadorus Siculus*, *Pompeius Trogus*, *Eusebius*, *Synellus*, and all the Ancients that take notice of the *Affyrian History*, have afterwards copied.

Ctesias knew he should be straitned to find Employment for so many Kings for *MCCC Years*; and so he says, they did little

little memorable after *Sennirami's* Time. As if it were probable that a great Empire could lie still for above a M Years; or that no Popular Generals should wrest the Reins out of the Hands of such drowzy Masters in all that time. No History but this can give an Instance of a Family that lasted for above a M Years, without any Interruption. And of all its Kings, not one is said to Reign less than ~~xxx~~ but some ~~xx~~ Years. The Healthiest Race that ever was heard of; of whom in ~~1000~~ Years, not one seems to have died an untimely Death. If any Thing can be shewed like this in any other History, Sacred or Profane, it will be easie to believe whatsoever is asserted upon this Subject.

If therefore the *Chaldean* Learning was no older than their Monarchy, it was of no great standing, if compared with the *Egyptian*. The Account of *Nebuchadnezzar's* Dream, in the ~~II~~ Chapter of *Daniel*, shews the *Chaldean* Magic to have been downright Knavery; since *Nebuchadnezzar* might reasonably expect that those should tell Him what his Dream was, who pretended to interpret it when it was told them, both equally requiring a Super-natural Assistance. Yet there by their chiefest Strength; or, at least, they

said so: Their other Learning is all lost. However, one can hardly believe that it was ever very great, that considers how little there remains of real Value, that was learn'd from the *Chaldeans*. The History of Learning is not so lamely conveyed to us, but so much would, in all probability, have escaped the general Shipwreck; as that, by what was saved, we might have been able to guess at what was lost.

(2.) That if the Learning of these *Ancient Chaldeans* came as near that of the *Arabs* as their Countries did; one may give as good a Judgment of the Extent of the *Arabian* Learning, as of the *Chaldean*. Sir *William Temple* rightly observes, that Countries little exposed to Invasions, preserve Knowledge better than others that are perpetually harrassed by a Foreign Enemy; and by consequence, whatsoever Learning the *Arabs* had, they kept; unless we should suppose that they lost it through Carelessness. We never read of any Conquests that pierced into the Heart of *Arabia the Happy*, *Mahomet's* Country, before the Beginning of the *Saracen* Empire. It is very strange therefore, if, in its Passage through this noble Country, inhabited by a sprightly, ingenious People, Learning, like Quick-silver, should

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run through, and leave so few of its influences behind it. It is certain that the *Arabs* were not a learned People when they over-spread *Asia*. So that when afterwards they translated the *Græcian* Learning into their own Language, they had but little of their own, which was not taken from those Fountains. Their *Astronomy* and *Astrology* was taken from *Ptolemy*, their *Philosophy* from *Aristotle*, their *Medics* from *Galen*; and so on. *Aristotle* and *Euclid* were first translated into *Latin*, from *Arabic* Copies; and those Barbarous Translations were the only Elements upon which the *Western School-men* and *Mathematicians* built. If they learn'd any thing considerable else where, it might be *Chymistry* and *Alchymy* from the *Egyptians*; unless we should say that they translated *Synefius*, or *Zosimus*, or some other *Græcian Chymists*.

Hence it follows, that the *Arabs* borrowed the greatest part, at least, of their Knowledge from the *Greeks*, though they had much greater Advantages of Communicating with the more Eastern Parts of the World, than either *Greeks* or *Romans* ever had. They could have acquainted us with all that was rare and valuable amongst those Ancient Sages. The *Saracen*
Empire

Empire was under one Head in *Almanzor's* Time, and was then almost as far extended Eastward as ever afterwards. His Subjects had a free Passage, from the *Tagus* to the *Ganges*; and being united by the common Bond of the same Religion, the *Brachmans*, some of whom did, in all probability, embrace the *Mahometan* Faith, would not be shy of revealing what they knew, to their *Arabian* Masters. By this means, the Learning of the *Egyptians*, *Chaldeans*, *Indians*, *Greeks* and *Arabs*, ran in one common Channel. For several Ages, Learning was so much in fashion amongst them, and they took such care to bring it all into their own Language, that some of the learnedest *Jews*, *Maimonides* in particular, wrote in *Arabic*, as much as in their own Tongue. We might reasonably therefore have expected to have found greater Treasures in the Writings of these learned *Mahometans*, than ever were discovered before: And yet those that have been conversant with their Books, say, that there is little to be found amongst them, which any body might not have understood as well as they, if he had carefully studied the Writings of their *Grecian* Masters. There have been so many Thousands of *Arabic* and *Persic* MSS. brought over into Eu-

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rope, that our learned Men can make as good, nay, perhaps, a better Judgment of the Extent of their Learning, than can be made, at this distance, of the *Greek*. There are vast Quantities of their Astronomical Observations in the *Bodleian Library*, and yet Mr. *Greaves* and Dr. *Edward Bernard*, two very able Judges, have given the World no Account of any Thing out of them, which those *Arabian* Astronomers did not, or might not have learn'd from *Ptolemee's Almagest*, if we set aside their Observations which their *Græcian* Masters taught them to make; which, to give them their due, Dr. *Bernard* commends, as much more valuable than is commonly believed, in a Letter to Dr. *Huntingdon*, printed in the *Philosophical Transactions*, containing their Observations of the Latitudes of Twenty of the most eminent of the Fixed Stars. We owe, indeed, to them alone the Way of Counting by Ten Cyphers, ascending beyond Ten in a Decuple Proportion; which is of unspeakable Use in *Astronomical* and *Algebraical* Calculations, and indeed, in all Parts of *Arithmetic*. The Use of *Chymistry* in *Physic*, together with some of the most considerable Chymical Preparations, which have led the Way to most of the late Discoveries that have been

been made in that Art, and in *Natural Philosophy* by its means, have been unanimously ascribed to the *Arabs* by those Physicians that have studied their Books (i). Though, in strictness, the whole *Arabian Learning*, with all their Inventions, what, and how great soever they were, may be reckoned as Modern, according to Sir *William Temple's* Computation. But I have in this whole Dispute confined my self to *Moderns*, in the strictest sence of the word, and have only argued from what has been done by the learned Men of these two last Ages, after the *Greeks* brought their Learning along with them into *Italy*, upon the Taking of *Constantinople* by the *Turks*. So that the *Arabs* are Ancients here; and what has been said already, evidently proves that the *Old Arabian Learning* could never be any one of those Fountains from whence the *Græcian* might have been drawn, and consequently can never be urged as such by those who give an Account of the History of Learning.

(i) Vid.
Morhofii
Epist. ad
Langelot-
tum.

CHAP. XII.

Of the Learning of the Ancient Indians and Chineses.

WE are now arrived in our Passage Eastward as far as the *Indies*, where the first Springs of that Learning which afterwards flow'd always Westward, arose. Thither *Pythagoras* is said to have gone, and to have fetch'd from thence his celebrated Doctrine of the *Transmigration of Souls*, which he taught, and is now believed by the Modern *Brahmins* as it was the Opinion of the *Brachmans* of old.

We have very little if any Account of these *Indian Philosophers* before *Alexander the Great*, who extended his Conquests as far as the *River Indus*. His Historians acquaint us with a Set of Philosophers in that Country, who practised great Austerities themselves, and taught others that Wisdom lay in living upon a little, in Abstaining from almost all sorts of Natural Pleasures, and Promoting the Prosperity and Welfare of the rest of Mankind. The Description that *Strabo* gives us of them, out of *Megasthenes*,

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Onesivritus and *Aristobolus*, which is very well Abridged by *Sir W. T.* is the Fullest and most Authentic that we have. And that the Body of it may be True, is probable from the Accounts of their Successors the *Bramines*, which are given us by *Monsieur Bernier*, and *Abraham Roger*, who lived many Years among them, and made it their Business to collect their Opinions with all the Exactness they could.

The superstitious Care which these People take to follow the Customs, and propagate the Opinions of their Ancestors, be they never so absurd and senseless, plainly shews that they would have preserved their Learning with equal Care, had there been any of it to preserve. They keep a Collection of the wise Sayings of one *Barthrouberri*, which *Monsieur Roger* has given us a Taste of, but such miserable Stuff for the generality, that one cannot read them without smiling at the Simplicity of those that can admire them. They would not shew *Monsieur Roger* their Book of the Law, which they pretend to be sent from God; but by the Account which his *Bramine* Doctor gave of it, it is only an absurd History of the fabulous Successions of their Deities, and as absurd a Collection of superstitious Cere-

monies, by which they were to be worshipped. Their Doctrine of the *Transmigration of Souls*, which *Pythagoras* first taught in the West, is a precarious idle Notion, which these besotted *Indians* do so blindly believe, that they are afraid of killing a Flea or a Louse, for fear of disturbing the Soul of one of their Ancestors. Though at the same time they scruple not to force Multitudes of poor silly Women, and sometimes too, full sore against their Wills, to burn themselves alive with their deceased Husbands Bodies, under a Pretence of their being serviceable to them in another World, though they are far from having any Assurance that their Husbands will there stand in need of them. Can we believe that there is a generous Spirit residing in a People, who have now for MM or MMM Years placed the highest degrees of Sanctity and Prudence in half-starving themselves, and depriving themselves of the lawful Conveniencies of Life? Yet these were the chiefest Employments of the Ancient *Brachmans*, as they are still of the Modern *Bramines*.

So that there is Reason to fear that the Stories of the extraordinary Wisdom of the Ancient *Brachmans* are in a great measure fabulous, because in the idle and bigotted

bigotted part of the Narrative they do so particularly agree with the Modern Bramines; and also, because if one consults what the Ancients have recorded of the Brachman's in Alexander's time, which is all gathered into a Body by Sir Edward Byshe (k), he will find that the Accounts which come the nearest to the Fountain, have less in them of the Romance, (l) and that their Historians have expatiated and flourish'd more, as they were at the greater distance.

(k) *Palladius de Gentibus Indiae, & Bragmanibus*, Edit. Biffai, Lond. 1665.

(l) Let but any Man compare Strabo and Palladius together, and he will see the difference, though 'tis plain they relate to the same Time,

For, upon comparing what all those Authors there quoted have said, I am inclinable to believe, that all we know of the Ancient Brachmans, is due to the Accounts which Alexander's Companions have given us.

But let us enter into Particulars. Sir W. T. tells us, out of Strabo, (m) "That their (m) Lib. 15. Opinions in Natural Philosophy, were, "that the *World* was *Round*; that it had "a Beginning, and wou'd have an End, "but reckoned both by immense Periods "of Time; that the Author of it was a "Spirit, or a Mind that pervaded the "whole Universe, and was diffused through "all the Parts of it; and that they held "the Transmigration of Souls, and some

"used Discourses of Infernal Mansions,
 (n) *Essay*, "in many things like those of *Plato*." (n)
 pag. 17. Whether *Megasthenes*, from whom *Strabo*
 takes all this Account, has not made it
 a little more beautiful than he ought, is
 very much question, since Monsieur Ber-

(n) *Voyages*, *nier* says, (n) That the *Bramines* believe,
 Tom. 3. "That the *Earth* is *Flat*, and *Triangular*,
 pag. 168. "with several *Stories*, all differing in
 Edit. Eng. "Beauty, Perfection and Inhabitants, each
 "of which is encompassed, they say, by
 "its *Sea*; that one of these *Seas* is of
 "Milk, another of *Sugar*, the third of
 "Butter, the fourth of *Wine*, and so forth:
 "so that after one *Earth* there comes a
 "Sea, and after a *Sea* an *Earth*, and so

(p) An Imaginary
 Mountain, which they
 place in the midst of the
 Earth.

(q) The Semi-Gods
 of the *Bramines*.

"on to seven, beginning from
 "Someire (p), which is in
 "the midst of these *Stories*:
 "That the first *Story*, which
 "is at the foot of *Someire*,
 "hath *Denta's* (q) for its In-
 "habitants which are very
 "Perfect; that the second contains
 "likewise *Denta's*, but less perfect; and
 "so of the rest, still lessening the Per-
 "fection to the seventh, which, they say,
 "is ours; that is, of Men far less Per-
 "fect than all the *Denta's*: And, lastly,
 "That this whole *Mass* is sustained
 "upon the Heads of divers *Elephants*,
 "which

“ which when they stir, cause an Earth-quake.” Upon all this, and abundance more of the like nature in *Astronomy, Anatomy, Medicine, and Physic’s*, which seems to be the true Oriental Doctrine, consonant to those noble Discoveries which are in (r) *Monfieur Roger’s History of the Lives and Manners of the Bramines*, (r) *Histoire de la Vie & des Mœurs des Bramines.* Monfieur Bernier makes this Remark; (s) “ All these strange Impertinencies, (s) Pag. 169. “ which I have had the patience to relate, “ have often made me think, that if they “ be those famous Sciences of the Ancient *Brachmans* of the *Indies*, very “ many have been deceived in the great “ Opinion they entertained of them. “ For my part, I can hardly believe it, “ but that I find the Religion of the *Indians* to be from immemorial Times; “ that ’tis written in the *Hanscrit* Language, which cannot but be very ancient, since its Beginning is unknown, “ and ’tis a dead Language, not understood but by the Learned; that all “ their Books are only written in that “ Tongue: all which are as many Marks “ of a very great Antiquity.” This, by the way, confutes the Opinion of those (t) who make the *Indian* Learning to be all Traditionary; for not only their Religious, but their Profane Knowledge too, (t) Sir W. T. his Essay, p. 17.

too, is all written in this *Hanscrit* Dialect.

Yet one Notion of these *Bramines* I cannot but take notice of, because it is a very Philosophical one, and has been with probability started and defended by some of the most curious Anatomists of the present Age, who built their Hypothesis upon the latest Discoveries which have been made in that admirable Art: I shall set it down in Monsieur *Bernier's* words; (u) "The Seeds of Plants and Animals are not formed anew, but were contrived in the first Production of the World, and dispensed abroad every where, and mixed in all things; and that they are not only potentially but actually the very and entire Plants, and Animals, though so small, that their Parts cannot be distinguisht, but when put into a convenient Womb, and there nourisht, they extend themselves and encrease: So that the Seeds of an Apple and Pear-Tree, are a little, entire, and perfect Apple and Pear-Tree, having all its Essential Parts; And so the Seeds of an Horse, an Elephant, a Man, &c. are a little Horse, a little Elephant, a little Man, in which there wants nothing but the Soul and Nourishment to make them appear what they are."

This

This Opinion seems rather to have been maintained by a *Leeuwenhoeck*, or a *Malpighius*, than by an *Indian*, who, as Monsieur *Bernier* assures us, (w) understands (w) Pag. 166. nothing at all of *Anatomy*, and can speak nothing upon that Subject but what is impertinent. Had it been the Result of Thought and Meditation, founded upon proper Premises, which must be the Effects of many and repeated Observations, one might justly have looked for, and would infallibly have found many other Notions of equal Subtilty among these *Bramines*; which though erroneous, (and so, perhaps, may this be,) yet could not have been made by any but Skilful Men. Such Discoveries likewise would have obliged us to have entertained a very honourable Notion of the Learning of the Ancient *Brachmans*; because, though they might have been Modern, in comparison of those Ancient Times, yet they might not also, for ought we knew, and consequently might have been challenged to those Ancient Philosophers by their Modern Champions. But when, amidst a vast variety of wild and phantastical Opinions, a Man meets with one or two which stand alone by themselves, without any thing that appears to have raised or confirmed them, he ought not presently to conclude, that the

the Philosophers who maintain them are Wise and Learned Men, though once, perhaps, or twice, *Quod nequit Ingenium, Casus fecit.*

By this time, I am afraid I shall be thought as Tedious as an *Irish Tale-teller*, fit only to lull my Reader asleep: But there is but one Stage more left; and though it is a great Way off, yet it may be easily reached upon Paper, and then will be as easily dispatched. For *China*, we are told, is a charming Countrey, and therefore most proper to be thought upon at the End of a tedious Discourse.

Sir *William Temple* knows very well, that the whole *Chinese* History depends upon the sole Authority of *Martinus*, and those Missionaries who published *Confucius* lately at *Paris*. *Martinus* (x) tells his

(x) *Hist. Sinic. Praefat.*

Reader, that he was obliged to learn Sixty Thousand independent Characters before he could read the *Chinese* Authors with ease. This is, without all doubt, an excellent Method to propagate Learning, when Eight or Ten of the best Years of a Man's Life must be spent in learning to Read. The most considerable Specimen of *Chinese* Learning that we have, is in the Writings of *Confucius*; which, if *F. Couplet* and his Companions had printed under their own Names, (y) those Rules and

(y) *Pag. 178.*

and Instructions discoursed of with great Compass of Knowledge, Excellence of Sense, Reach of Wit, illustrated with Elegance of Style, and Aptness of Similitudes and Examples, would soon have been called an incoherent Rhapsody of Moral Sayings, with which good Sense and tolerable Experience might have furnished any Man, as well as Confucius.

If the Chinese think every part of Knowledge, but their own Confucian Ethics, ignoble and mechanical, why are the European Missionaries so much respected for their Skill in Medicine and Mathematics? So much Knowledge in Mathematics as will but just serve an Almanack-maker, will do their Business. F. Kenbriest says, in a Letter printed some Years since in the *Philosophical Transactions*, That the Honours which were paid him in the Emperor's Court, were in a great measure owing to his Teaching the Emperor to find the Time of the Night by the Fixed Stars, and an Astrolabe: This shews that the Chinese were but meanly skilled in these Things; and it is probable, that those who are ignorant of such ordinary Matters, seldom carry their Speculations to a much greater Height.

Martinus and Trigautius, who lived long in China, were able fully to inform the

the World of the Extent of the Chinese Knowledge; and the Pains which *Martinus* has taken to write the History, and to state the Geography of that mighty Empire, is a sufficient Indication of his great Willingness to advance its Reputation in *Europe*. The *Chinese* are certainly a sagacious and industrious People, and their Skill in many Mechanical Arts shew them to be so; so that if they had ever applied themselves to Learning in good earnest, and that for near so long a Time, as their History pretends to, there is no Question but we should have heard much more of their Progress. And therefore, whatsoever can be said of *Chinese* Knowledge, can never be of any weight, as long as small Skill in *Physic* and *Mathematics* shall be enough to protect the *European* Missionaries in a Court where they themselves are esteemed the greatest Scholars, and honoured accordingly.

But the *Chinese Physic* is wonderfully commended by Dr. *Vossius* and Sir *William Temple* (2): The Physicians excel in the Knowledge of the Pulse, and of all simple Medicines, and go little further: Neither need they; for in the first, they are so skilful, that they pretend not only to tell by it, how many Hours or Days a sick Man may last; but how many Tears a Man

(2) Pag.
179, 18c.

in perfect seeming Health may live, in case of no Accident or Violence; and by Simples, they pretend to relieve all Diseases that Nature will allow to be cured. What this boasted Skill is, may be seen in the little Tracts of the Chinese Physic, published by Andrew Cleyer (a); but because few will, in all probability, have patience to go through with them, since they are not very pleasant to read, I shall give a short Specimen of them, by which one may judge of the rest.

(a) Specimen Medicinae Sinaicae. Francof. 1682. Quarto.

The most Ancient Chinese Discourse of Physic, entituled, Nuy Kim (b), gives this Account of the Production of our Bodies, and of the Relation of the several Parts, with the Five Elements:

(b) Ibid. Pag. 85, 86, 87.

‘ Out of the Eastern Region arises the
 ‘ Wind, out of the Wind Wood, or Plants,
 ‘ out of Wood Acidity, from thence the
 ‘ Liver, from the Liver the Nerves, from
 ‘ them the Heart: The Liver is gene-
 ‘ rated the Third in Order, and perfected
 ‘ the Eighth: The Spirits of the Liver,
 ‘ as they relate to the Heaven (the Air)
 ‘ are Wind; as Wood in the Earth, as the
 ‘ Nerves in our Bodies, so is the Liver in
 ‘ the Limbs: Its Colour is Blue, and its
 ‘ Use and Action is to move the Nerves:
 ‘ The Eyes are the Windows of the Liver;
 ‘ its Taste is acid, its Passion or Affection is
 ‘ Anger:

' Anger : Anger hurts the Liver, but Sor-
 ' row and Compassion conquer Anger,
 ' because Sorrow is the Passion of the
 ' Lungs, and the Lungs are Enemies to
 ' the Liver : Wind hurts the Nerves, but
 ' Drought, the Quality of the Lungs, con-
 ' quers Wind : Acidity hurts the Nerves,
 ' but Acrimony, or that sharp Taste which
 ' is proper to the Lungs, conquers Acidity,
 ' or Metal Conquers Wood.

' Out of the Southern Region arises
 ' Heat, out of Heat Fire, out of Fire Bit-
 ' terness : From it the Heart is generated,
 ' thence the Blood ; out of Blood comes
 ' the Spleen, or Earth out of Fire, the
 ' Heart governs the Tongue ; that which
 ' is Heat in Heaven, Fire upon Earth,
 ' Pulsation in the Body, is the Heart in
 ' the Members : Its Colour is Red, has
 ' the Sound of Laughing ; its Vicissitudes
 ' are Joy and Sorrow ; the Tongue is its
 ' Window, its Taste Bitterness, its Passion
 ' Joy ; too much Joy hurts the Heart ;
 ' but Fear, the Passion of the Reins, which
 ' are Enemies to the Heart, conquers Joy :
 ' Heat hurts the Spirits, but Cold con-
 ' quers Heat : Bitterness hurts the Spirits,
 ' but Saltiness of the Reins conquers Bitter-
 ' ness, or Water quenches Fire. The Heart
 ' is generated the Second in Order, and is
 ' perfected the Seventh.

' Out

'Out of the Middle Region ariseth Moisture; out of that Earth; out of Earth Sweetness; from Sweetness cometh the Spleen, Flesh from that, and the Lungs from Flesh: The Spleen governs the Mouth; that which is Moisture in the Heaven, is Earth in Earth, Flesh in the Body, and the Spleen in the Members: Its Colour is Yellow; it has the Sound of Singing; its Window is the Mouth, its Taste is sweet, its Passion is much Thoughtfulness: Thoughtfulness hurts the Spleen, but Anger conquers Thoughtfulness: Moisture hurts Flesh, but Wind conquers Moisture: Sweetness hurts Flesh, but Acidity conquers Sweetness: In a word, Wood conquers Earth, or the Liver the Spleen. The Spleen is generated the Fifth in Order, and is perfected the Tenth.

'Out of the Western Region arises Drought: Thence come Metals, from them comes Sharpness, out of that are the Lungs, out of the Lungs comes Skin and Hair, out of Skin and Hair come the Reins; the Lungs govern the Nostrils: That which is Drought in the Heaven (or Air) is Metal in the Earth, Hair and Skin in the Body, and Lungs in the Members: Its Colour is Whitish, has the Sound of Weeping; its Win-

M

dows

dows are the Nostrils, its Taste is Sharp, its Passion is Sorrow : Sorrow hurts the Lungs, but Joy conquers Sorrow : Heat hurts the Skin and Hair, but the Cold of the Reins conquers Heat : Sharpness hurts the Skin and Hair, but Bitterness conquers Sharpness. The Lungs are generated the Fourth in Order, and are perfected the Ninth.

Out of the Northern Region arises Cold, out of Cold comes Water, thence Saltness, thence the Reins, thence the Marrow of the Bones, thence the Liver. The Reins govern the Ears ; that which is Cold in the Air, Water in the Earth, Bones in the Body, is Reins in the Members : Its Colour is Blackish, has the Sound of Sobbing ; its Windows are the Ears, its Taste is Saltness, its Passion is Fear : Fear hurts the Reins, but Thoughtfulness conquers Fear : Cold hurts the Blood, but Drought conquers Cold : Saltness hurts the Blood, but Sweetness conquers Saltness. The Reins are generated the First in Order, and perfected the Sixth.

(c) *Risum
forte plus
movebit
Europæo,
quam plau-
sum. ibid.
pag. 87.*

The Missionary who sent this Account to Cleyer a Physician at Batavia, was afraid (c) that it would be thought ridiculous by Europeans ; which Fear of his seems to have been well grounded. Another

ther who lived long in *China*, wrote also an Account of the *Chinese* Notions of the Nature and Difference of Pulses, which he (d) professes that he would not undertake to prove by *European* Principles. One may judge of their Worth by the following Specimen (e):

(d) *Haud-
quaquam
juscipiam
principia
ista princi-
piis nostra-
ribus pro-
banda. ibid.
pag. 2.
(e) Ibid.
pag. 3, 4.*

The *Chinese*s divide the Body into Three Regions: The First is from the Head to the Diaphragm: The Second from thence to the Navel, containing Stomach, Spleen, Liver and Gall, and the Third to the Feet, containing the Bladder, Ureters, Reins and Guts. To these Three Regions, they assign Three sorts of Pulses in each Hand. The uppermost Pulse is governed by the radical Heat, and is therefore in its own Nature overflowing and great. The lowermost is governed by the Radical Moisture, which lies deeper than the rest, and is like a Root to the rest of the Branches: The middlemost lies between them both, partakes equally of Radical Heat and Moisture, and answers to the middle Region of the Body, as the uppermost and lowermost do to the other two. By these Three sorts of Pulses, they pretend to examine all sorts of Acute Diseases, and these also are examined Three several Ways: Diseases

In the Left-Side are shewn by the Pulses of the Left-Hand, and Diseases in the Right-Side by the Pulses of the Right. It would be tedious to dwell any longer upon such Notions as these, which every Page in *Cleyer's* Book is full of. The Anatomical Figures annexed to the Tracts, which also were sent out of *China*, are so very whimsical, that a Man would almost believe the whole to be a Banter, if these Theories were not agreeable to the occasional Hints that may be found in the Travels of the Missionaries. This, however, does no Prejudice to their Simple Medicines, which may, perhaps, be very admirable, and which a long Experience may have taught the *Chineses* to apply with great success; and it is possible that they may sometimes give not unhappy Guesses in ordinary Cases, by feeling their Patients Pulses. Still this is little to Physic, as an Art; and however, the *Chineses* may be allowed to be excellent Empiricks, as many of the *West-Indian* Salvages are, yet it cannot be believed that they can be tolerable Philosophers; which, in an Enquiry into the Learning of any Nation, is the first Question that is to be considered.

Thus

Thus I have taken a short View of the Learning of the East. Sir W. T. is not the only Man who has asserted great things concerning it. Other Men, to strengthen their particular Hypotheses, have exalted it as much as he: Of all these, few have taken greater Pains than Dr. Burnet (f), who having given us a new Theory of the Creation and the Deluge, was obliged to examine into the Traditions of the oldest Nations, especially those which pretended most to ancient Monuments of their own Extraction, and the Origination of Mankind. If his Enquiries have not proved what he particularly designed they should, which was, the attesting to the Truth of his own Hypotheses; yet they have proved an almost universal Tradition of the World's being once made out of a Chaos, with many other Points, which do exceedingly strengthen our Belief of the *Mosaical* History. He ingenuously owns, that when once the Business came to downright Reasoning, to raising Principles, and drawing Conclusions from those Principles, the Greeks went very much beyond their Teachers; and he does as good as confess, that all the *Barbaric Philosophy* was either *Traditionary* or *Superstitious*. His Authority is of great Moment here, be-

(f) *Archæolog. Philosoph.*

cause his Design led him to make an Accurate Enquiry into these Things; which Design he has very carefully executed.

Now, if the Philosophy of the Eastern Nations was all *Traditionary*, 'tis plain their other Learning could not be profound. For great Skill in *Geometry*, *Astronomy*, *Natural History*, the *Experimental part of Physic's*, or *Medicine*, will naturally lead Men into Enquiries into the Causes of the *Phænomena* which daily occur. Those Enquiries will necessarily produce Principles and Hypotheses; which Principles and Hypotheses, though for want of sufficient Light, they may be precarious and groundless, yea, sometimes, possibly, absurd and phantastical, yet will evidently shew, that the Philosophers who devised them, were Men of Search and Reasoning, of Knowledge and Experience.

The several Hypotheses of Ancient and Modern Philosophers, since Hypotheses have first been introduced to account for the *Phænomena* of Nature, do plainly prove this Matter. The *Aristotelians*, who solve all by a Mixture of the Four Elements, go upon Observations and Experiments, such as they are. The *Ancient Chymists*, who found Salt, Sulphur and Mercury in all Mix'd Bodies, prove (as they think) their

their Hypothesis by Matter of Fact. So the more Modern ones; some of whom, compound every thing out of Acids and *Alkali's*; others join with the Corpuscularians, who solve all by the various Motions of Minute Bodies. Still all these Sects pretend Observation and Experience; and the successive Alteration of their Hypotheses, shews that their Stock of Knowledge did proportionably encrease. Wherefore, since this has been the Constant, and is the Natural Method, we ought to conclude, that if the *Barbaric Philosophy* had been built upon such Foundations, it would have produced like Effects.

Whereas *Tradition*, the Fountain of all their Knowledge, is only the Effect of Memory: And as it shews, that there is no Inquisitive Genius (the Mother of all Knowledge) in the People who content themselves with it, so all Acquiescence in it is utterly inconsistent with great Progresses in Natural Learning, of any sort, unless, perhaps, we should except Abstracted Mathematics; which too, whether they need be excepted, may be justly questioned.

If, indeed, the Traditions of the East had comprehended a System of Natural Knowledge, had given an Account of the leading *Phænomena* of the Universe, had,

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in short, been any thing else but bare Memorials, and those short, imperfect and obscure, of what the World once was, and what it should hereafter be, they would be much more valuable for the present Purpose, than any Conclusions made by the exactest Reasoning possible. They would then, as they ought, be esteemed as Revelations made by Him that made the World, and consequently, could best tell in what Manner, and for what Ends and Purposes he has created, and does preserve this Planetary System in which we live. But since this is not pretended to, and if it were, could not be made good, I cannot possibly see how those who allow the *Greeks* to have been the chief Advancers of *Science* as opposed to *Tradition* amongst the Ancients, can deny that Natural Learning, in every Particular, was carried to a greater height by them, than by any of the Oriental Nations.

It is therefore now high time to leave those Countries, in some of which there seems never to have been any solid Learning originally, and in the rest but the Beginnings of it, to come to *Greece*, as it stood in the Age of *Aristotle*, *Theophrastus*, *Euclid*, and those other Great Men, who, about the Time of *Alexander the Great*,
and

and afterwards, made such mighty Progresses in almost all Parts of real Learning. If, upon Enquiry, it shall be found, that a Comparison may be made between these Ancients and the Moderns, upon any Heads wherein Learning is principally concerned, which will not be to the Disadvantage of the latter, then there needs not anything to be said further. Whether it can or no, is now to be enquired.

CHAPTER XIII.

Of Ancient and Modern Logic and Metaphysics.

SINCE all that has been said in the Second and Third Chapters, concerning the *Ethics*, *Politics*, *Eloquence* and *Poesie* of the Ancient *Græcians*, belongs to them in their most flourishing Ages, a great Part of the Subject Matter of this Enquiry has already been dispatched. The remaining Parts of their Knowledge may be reduced to these Four Heads: *Logic*, *Metaphysics*, *Mathematics* and *Physiology*. *Logic* is the *Art of Reasoning*; but by it Men commonly understand the *Art of Disputing*,

Disputing, and making Syllogisms, of Answering an Adversary's Objections dexterously, and making such others as cannot easily be evaded: In short, of making a plausible Defence, or starting probable Objections, for or against any Thing. As this is taught in the Schools, it is certainly owing to the Ancients: *Aristotle's Organon* is the great Text by which Modern *Logicians* have framed their Systems; and nothing, perhaps, can be devised more subtle in that captious Art (g), than the *Sophisms* of the Ancient *Stoics*. But as *Logic* is truly the Art of Reasoning justly, so as not only to be able to explain our own Notions, and prove our own Assertions, clearly and distinctly, but to carry our Speculations further than other Men have carried theirs, upon the same Arguments, it has not only been much cultivated by Modern Philosophers, but as far pursued as ever it was by the Ancients: For hereby have the late Enquiries been made into *Physical*, *Metaphysical* and *Mathematical* Matters, the Extent whereof is hereafter to be examined. Hereby the Ancient *Mathematicians* made their Discoveries, and when they had done, they concealed their Art; for, though we have many noble Propositions of theirs, yet we have few Hints how they found

(g) Vid.
A. Gellii
Noct. At.
sic. lib. 1.
cap. 2.

found them out; since the Knowledge of the fore-going Books in *Euclid's Elements* is necessary to explain the Subsequent, but is of little or no use to help us to find out any Propositions in the subsequent Books, which are not immediate Corollaries from what went before) in case those Books had been lost. Whether the Moderns have been deficient in this noble Part of *Logic*, may be seen by those who will compare *Des Cartes's Discourse of Method*, *Mr. Lock's Essay of Humane Understanding*, and *Tschirnhaus's Medicina Mentis*, with what we have of the Ancients concerning the *Art of Thinking*. Such a Comparison would not be to the Disadvantage of those Modern Authors; for, though it may be pretended, that their Thoughts and Discoveries are not entirely new in themselves, yet to us, at least, they are so, since they are not immediately owing to ancient Assistances, but to their own Strength of Thinking, and Force of Genius. And since this Art is, indeed, the Foundation of all Knowledge, I ought to take notice, that my Lord Bacon and *Des Cartes* were the two Great Men, who both found fault with the *Logic* of the Schools, as insufficient of itself for the great Design of *Logic*, which is the Advancement of real Learning; and
got

got Authority enough to persuade the World, in a very great degree, that other Methods must be taken, besides making Syllogisms, and ranking the Sorts of Things under Predicaments and Predicables, by those who would go much farther than their Predecessors went before them. The true Use of the common Logic, being rather to explain what we know already, and to detect the Fallacies of our Adversaries, than to find that out, of which we before were ignorant. So that the Moderns have enlarged its Bottom; and by adding that *Desideratum* which the Ancients either did not perfectly know, or, which is worse, did invidiously conceal, namely, *the Method of Discovering Unknown Truths*; as Monsieur *Tschirnhaus* calls it, have, if not made it perfect, yet put it into such a Posture, as that future Industry may very happily compleat it.

Metaphysics is properly that Science which teaches us those Things that are out of the Sphere of Matter and Motion, and is conversant about God, and Spirits, and Incorporeal Substances. Of these Things *Plato* and his Disciples wrote a great deal: They plainly saw, that something beyond Matter was requisite to create and preserve the August Frame of the

the World. If we abstract from Revelation, the *Cartesians* discourse more intelligibly concerning them, than any of the Ancients. So that tho' very many of their particular Notions, as also of F. *Mallebranche's*, M. *Poyret's*, and other Modern *Metaphysicians*, are justly liable to Exception, yet the main Foundations upon which they reason, are, for the most part, real; and so, by consequence, the Superstructures are not entirely fantastical: And therefore they afford a vast Number of Hints to those who love to apply their Thoughts that way, which are useful to enlarge Men's Understandings, and to guide their Manners. This, which is strictly true of the Modern *Metaphysics*, is as much as can be said of the Ancient: And because a Comparison cannot be made without reading their several Writings, the surest way to try the Truth of this Proposition, will be to read *Plato* and his Commentators; and along with them, *Des Cartes's Meditations*, *Velthuyfus de Initiis primæ Philosophiæ*, *Mallebranche's Recherche de la Verité*, *Poyret's Cogitationes de Deo*, and Mr. *Lock's Essay of Humane Understanding*, already mentioned. This may be done, without undervaluing what the Ancients wrote upon these noble Subjects: And the Question

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the World. If we abstract from Revelation, the *Cartesians* discourse more intelligibly concerning them, than any of the Ancients. So that tho' very many of their particular Notions, as also of F. *Mallebranche's*, *M. Poyret's*, and other Modern *Metaphysicians*, are justly liable to Exception, yet the main Foundations upon which they reason, are, for the most part, real; and so, by consequence, the Superstructures are not entirely fantastical: And therefore they afford a vast Number of Hints to those who love to apply their Thoughts that way, which are useful to enlarge Men's Understandings, and to guide their Manners. This, which is strictly true of the Modern *Metaphysics*, is as much as can be said of the Ancient: And because a Comparison cannot be made without reading their several Writings, the surest way to try the Truth of this Proposition, will be to read *Plato* and his Commentators; and along with them, *Des Cartes's Meditations*, *Velthuyus de Initiis primæ Philosophiæ*, *Mallebranche's Recherche de la Verité*, *Poyret's Cogitationes de Deo*, and Mr. *Lack's Essay of Humane Understanding*, already mentioned. This may be done, without undervaluing what the Ancients wrote upon these noble Subjects: And the Question

is

is not, *Whether they were Great Men*. But, *Whether the Moderns have said any thing upon these Matters, without Copying out of other Men's Writings?* Which, unless we will do them Wrong, we are bound to say they have.

CHAP. XIV.

Of Ancient and Modern Geometry and Arithmetic.

IN the Method which I set to my self in these *Reflections*, I chose to begin with an Enquiry into those Sciences whose Extent is more liable to be contested, and so onwards, to those in which the Controversie may more easily be determined. Monsieur Perrault, who has not finished his *Parallel*, that I know of, took it for granted, that if the Prize were allowed to the Moderns in *Eloquence*, in *Poesie*, in *Architecture*, in *Painting*, and in *Statuary*, the Cause would be given up in every thing else; and he, as the declared Advocate for the Moderns, might go on triumphantly with all the rest. Wherein, possibly, he was not, in the main, much mistaken.

staked

staken. How he intends to manage the remaining Part of his *Parallels*, I know not. I shall begin with *Abstracted Mathematics*; both because all its Propositions are of Eternal Truth, and besides, are the Genuine Foundations upon which all real *Physiology* must be built.

The Method which I shall follow is this: (1.) I shall enquire into the State of Ancient and Modern *Mathematics*, without any particular Application of the Properties of the several Lines and Numbers, Surfaces and Solids, to Physical Things.

(2.) I shall enquire what New Instruments have been invented, or Old ones improved, by which the Knowledge of Nature of any sort has been, or may be, further enlarged.

(3.) I shall enquire whether any Improvements have been actually made of *Natural History*, and of any *Physico-Mathematical* or *Physical Sciences*, such as *Astronomy*, *Music*, *Optics*, *Medics*, and the like.

(4.) From all this, I shall endeavour to pass a Judgment upon the Ancient and Modern Ways of *Philosophizing* concerning Nature in general, and its principal *Phænomena*, or *Appearances*.

I begin with *Geometry* and *Arithmetic*, because they are general Instruments whereby we come to the Knowledge of many of the abstrusest Things in Nature; since,

since, as *Plato* said of old, *God always Geometrizes in all his Works*. That this Comparison might be the more exact, I desired my Learned and Worthy Friend, *Mr. John Craig*, to give me his Thoughts upon this Matter: His own learned Writings upon the most difficult Parts of *Geometry*, for such are the *Quadratures of Curve Lines*, will be sufficient Vouchers for his Skill in these Things. I shall set down what he says, in his own Words:

'If we take a short View of the *Geometry* of the Ancients, it appears, that they considered no *Lines*, except *Streight Lines*, the *Circle*, and the *Conic Sections*. As for the *Spiral*, the *Quadratrix*, the *Conchoid*, the *Cissoid*, and a few others, they made little or no Account of them. It is true, they have given us many excellent and useful Theorems concerning the Properties of these others, but far short of what has been discovered since. Thus, to instance in the *Quadrature* of the *Circle*, which did so much exercise and perplex the Thoughts of the Ancients; How imperfect is that of *Archimedes*, in comparison of that exhibited by *Van Ceulen*. And every body knows how this is exceeded by the later Performances of *Mr. Newton*, and *Monsieur Leibnitz*. *Archimedes*, with a great deal

'deal of Labour, has given us the exact
'*Quadrature* of the *Parabola*; but the Re-
'stification of the *Parabolic Line*, depen-
'ding on the *Quadrature* of the *Hyperbola*,
'is the Invention of this last Age. The
'rare Properties of the *Conic Sections*, in
'the *Reflexion* and *Refraction* of *Light*, are
'the undoubted Discoveries of these later
'Times. It were easie to give more In-
'stances of this nature, but these are suf-
'ficient to shew how far the Modern Ma-
'thematicians have out-done the Ancients;
'in discovering the noblest and usefullest
'Theorems, even of those few Figures
'which they chiefly considered.

'But all this is nothing, in comparison
'of that boundless Extent which the Mo-
'dern Mathematicians have carried Geo-
'metry on to: Which consists in their
'receiving into it all the *Curve Lines* in
'Nature, together with the *Area's* and
'*Solids* that result from them; by distin-
'guishing them into certain *Kinds* and
'*Orders*; by giving general Methods of
'describing them, of determining their
'*Tangents*, their *Lengths*, their *Area's*, and
'the *Solids* made by the Rotation of them
about their Axes. Add to all this, the
general Methods that have been invented
of late for finding the Properties of a
great Number of these *Curves*, for the

N

Advance-

' Advancement of *Optics*, *Mechanics*, and
 ' other Parts of *Philosophy*. And let any
 ' Man of Sense give the Preference to the
 ' Ancient Geometry if he can.
 ' That the Ancients had general Me-
 ' thods of Constructing all plain Problems
 ' by a straight Line and a Circle, as also all
 ' Solid Problems by the help of a Conic
 ' Section, is most certain. But it is as
 ' certain that here they stopped, and could
 ' go no further, because they would not
 ' receive any Order of Curves beyond the
 ' Conic Sections, upon some nice Scrupu-
 ' losity in multiplying the Number of the
 ' *Postulata*, requisite to the describing of
 ' them: Whereas the Modern Geometers,
 ' particularly the Renowned *Des Cartes*,
 ' have given general Rules for Construct-
 ' ing all Problems of the Vth or VIth De-
 ' gree. Which Method, if rightly under-
 ' stood, is applicable to all Problems of
 ' any Superior Order.
 ' How deficient the Geometry of the
 ' Ancients was in that Part which related
 ' to the *Loca Geometrica*, is manifest from
 ' the Account that *Pappas* gives us of that
 ' Question, about which *Euclid* and *Apol-
 ' lonius* made so many ineffectual Attempts:
 ' The Solution whereof we owe entirely
 ' to Mr. *Isaac Newton* (h). For it is evi-
 ' dent, that *Des Cartes* mistook the true
 ' Intent

(h) *Philos.*
 P. 74, 75.

' Intent of the Ancients in this Matter.
' So that the *Lota Solida* is now one of
' the perfectest Parts of Geometry that
' we have, which before was one of the
' most confused and defective.

' From comparing the Ancient and
' Modern Geometry, I proceed to the
' Comparison of those Arts to which we
' owe the Improvements both of the one
' and the other. These are chiefly Two,
' *Algebra*, and the *Method of Indivisibles*.
' As to the latter of these, I shall not stand
' to enquire whether *Cavallerius* was the
' first Inventor, or only the Restorer of it.

' I know Dr. *Wallis* (1) is of Opinion, that (i) *Hist.*
' it is nothing but the Ancients *Method of* *of Algebra,*
' *Exhaustions*, a little disguised. It is e- *p. 285.*
' nough for your Purpose, that by the
' help of *Cavallerius's* Method, Geometry
' has been more promoted in this last Age,
' than it was in all the Ages before. It
' not only affords us neat and short De-
' monstrations, but shews us how to find
' out the abstrusest Theorems in Geometry.
' So that there has hardly been any con-
' siderable Improvement of late, which
' does not owe its Rise to it; as any Man
' may see, that considers the Works of
' *Cartes*, *Fermat*, *Van Heuraet*, *Huygens*,
' *Neil*, *Wallis*, *Barrow*, *Mercator*, *Leibnitz*,
' and *Newton*. *Archimedes's* Propositions

' of the Properties of a Sphere, and a Cy-
 ' linder, are some of the easiest Examples
 ' of this Method. How vastly more cu-
 ' rious and more useful Theorems have
 ' been since added to Geometry, is
 ' known to every one that is conversant
 ' in the afore-mentioned Authors; espe-
 ' cially Mr. *Newton*, *Leibnitz*, and *Huygens*:
 ' To instance in Particulars, were to
 ' transcribe their whole Books and Trea-
 ' tises.

' Let us, in the next place, compare
 ' the *Ancient* and *Modern Algebra*. That
 ' the Ancients had some kind of *Algebra*
 ' like unto ours, is the Opinion of several
 ' learned Writers of late: And it is evi-
 ' dent from the Seven remaining Books of
 ' *Diophantus*, that it was brought to a con-
 ' siderable Length in his Time. But how
 ' infinitely short this was of that *Algebra*
 ' which we now have, since *Vieta's* Time,
 ' will appear to any one that considers
 ' the different Process of both. For, tho'
 ' *Diophantus* has given us the Solution of
 ' a great many hard and knotty Arithme-
 ' tical Problems, yet the last Step of his
 ' Resolution serves only for one particular
 ' Example of each Problem: So that for
 ' every new Example of the same Que-
 ' stion, there must be a new Process made
 ' of the whole *Analysis*. Whereas, by our
 ' Modern

Modern *Algebra*, the *Analysis* of any one Case gives a general Canon for all the infinite Cases of each Problem ; whereby we discover many curious Theorems about the Properties of Numbers, not to be attained by *Diophantus's* Method ; this being the peculiar Advantage of *Specious Algebra*, first introduced by *Vieta*, and wonderfully promoted by several worthy Mathematicians since. Beside this intolerable Imperfection of the Ancient *Algebra*, used by *Diophantus*, which required as many different Operations as the Problem had different Examples, that is, infinite : all which are included in one general Solution by the Modern *Algebra* ; there is this great Defect in it, that in *Undetermined Questions*, which are capable of innumerable Solutions, *Diophantus's Algebra* can seldom find any more than one ; whereas, by the Modern *Algebra*, we can find innumerable, sometimes all in one Analysis ; tho' in many Problems we are obliged to re-iterate the Operation for every new Answer. This is sufficient to let you see, that (even in the Literal Sence) our *Algebra* does infinitely exceed that of the Ancients. Nor does the Excellency of our *Algebra* appear less in the great Improvements of

' Geometry. The reducing all Problems to
 ' Analytical Terms, has given Rise to those
 ' many excellent Methods whereby we
 ' have advanced Geometry infinitely be-
 ' yond the Limits assigned to it by the An-
 ' cients. To this we owe, (1.) The Express-
 ' sing all Curves by Equations, whereby we
 ' have a View of their Order, proceeding
 ' gradually on *in infinitum*. (2.) The
 ' Method of Constructing all Problems
 ' of any Assignable Dimension; whereas
 ' the Ancients never exceeded the Third.
 ' Nay, from the Account which Pappus
 ' gives us of the afore-mentioned Que-
 ' stion, it is evident, that the Ancients
 ' could go no further than Cubic Equa-
 ' tions: For he says expressly, they knew
 ' not what to make of the continual Mul-
 ' tiplication of any Number of Lines more
 ' than Three; they had no Notion of it.
 ' (3.) The Method of Measuring the
 ' Area's of many Infinities of Curvilinear
 ' Spaces; whereas Archimedes laboured
 ' with great Difficulty, and wrote a par-
 ' ticular Treatise of the Quadrature of
 ' only one (k), which is the simplest and
 ' easiest in Nature. (4.) The Method of
 ' Determining the Tangents of all Geome-
 ' tric Curve Lines; whereas the Ancients
 ' went no further than in Determining
 ' the Tangents of the Circle and Conic
 ' Sections.

(k) The
 Parabola.

Sections. 10 (5) The Method of Determining the Lengths of an infinite Number of Curves; whereas the Ancients could never measure the Length of one. If I should descend to Particulars, the Time would fail me. As our *Algebra*, so also our *Common Arithmetic* is prodigiously more perfect than theirs; of which, *Decimal Arithmetic* and *Logarithms* are so evident a Proof, that I need say no more about it.

I would not be thought, however, to have any Design to sully the Reputation of those Great Men, *Canon, Archimedes, Euclid, Apollonius, &c.* who, if they had lived to enjoy our Assistance, as we now do some of theirs, would, questionless, have been the greatest Ornaments of this Age, as they were deservedly the greatest Glory of their own."

Thus far Mr. *Craig*.

Those that have the Curiosity to see some of these Things proved at large, which Mr. *Craig* has contracted into one View, may be amply satisfied in Dr. *Wallis's History of Algebra*, joined with *Gerhard Vossius's Discourses De Scientiis Mathematicis*.

It must not here be forgotten, that Abstract Mathematical Sciences were exceedingly valued by the ancientest Philo-

sophers: None, that I know of, expressing a Contempt of them but *Epicurus*, though all did not study them alike. *Plato* is said to have written over the Door of his Academy, *Let no Man enter here, who does not understand Geometry*. None of all the learned Ancients has been more extolled by other learned Ancients, than *Archimedes*. So that, if in these Things the Moderns have made so great a Progress, this affords a convincing Argument, that it was not want of Genius which obliged them to stop at, or to come behind the Ancients in any thing else.

CHAP. XV.

Of several Instruments invented by the Moderns, which have helped to advance Learning.

HAVING now enquired into the State of *Mathematics*, as they relate to *Lines* and *Numbers* in general, I am next to go to those Sciences which consider them as they are applied to *Material Things*. But these being of several Sorts, and of a vast Extent, taking in no less than the whole

whole Material World, it ought to be observed, that they cannot be brought to any great Perfection, without Numbers of Tools, or Arts, which may be of the same Use as Tools, to make the Way plain to several Things, which otherwise, without their Help, would be inaccessible.

Of these Tools, or Instruments, some were anciently invented, and those Inventions were diligently pursued : Others are wholly new. According to their Uses, they may be ranged under these Two General Heads : (1.) Those which are useful to all Parts of Learning, though perhaps not to all alike. (2.) Those which are particularly subservient to a Natural Philosopher, and a Mathematician. Under the first Head one may place *Printing*, *Paper of Rags*, and *Engraving*. Under the latter come *Telescopes*, *Microscopes*, the *Thermometer*, the *Baroscope*, the *Air-Pump*, *Pendulum-Clocks*, *Chymistry*, and *Anatomy*. All these, but the two last, were absolutely unknown to the Ancient Greeks and Romans. *Chymistry* was known to the Greeks, and from them carried to the Arabs. *Anatomy* is, at least, as old as *Democritus* and *Hippocrates* ; and doubtless, among the exact *Ægyptians*, something older.

The

The Benefit of *Printing* has been so vast, that every thing else wherein the Moderns have pretended to excell the Ancients, is almost entirely owing to it : And withal, its general Uses are so obvious, that it would be Time lost to enlarge upon them; but it must be taken notice of, because

(1) Pag. 6. Sir William Temple has question'd (1) *whether Printing has multiplied Books, or only the Copies of them*; from whence he concludes, that we are not to suppose that the Ancients had not equal Advantages by the Writings of those that were ancient to them, as we have by the Writings of those that are ancient to us. But he may easily solve his own Doubt, if he does but reflect upon the Benefit to Learning which arises from the *multiplying Copies* of good Books : For though it should be allowed, that there were anciently as many Books as there are now, which is scarce credible; yet still the Moderns have hereby a vast Advantage, because, (1.) Books are much cheaper, and so come into more Hands. (2.) They are much more easily read: and so there is no Time lost in poring upon bad Hands, which weary the Readers, and spoil their Eyes. (3.) They can be printed with Indexes, and other necessary Divisions, which, though they might be made in MSS. yet they would then

then make them so voluminous and cumbersome, that not one in forty who now mind Books, because they love Reading, would then apply themselves to it.

(4.) The Notice of new and excellent Books is more easily dispersed. (5.) The Text is hereby better preserved entire, and is not so liable to be corrupted by the Ignorance or Malice of Transcribers; this is of great Moment in Mathematics, where the Alteration of a Letter, or a Cypher, may make a Demonstration unintelligible.

Paper made of *Linnen Rags*, may, in a larger sence, be reckoned also amongst Modern Inventions; the Improvement of which to the present Fineness and Cheapness, is almost of as great Advantage to Learning, as *Printing* it self: And if we were, with the *Old Greeks* and *Romans*, obliged to Write upon *Barks of Plants*, *smoothed Wood*, *Wax* or *Parchment*, we should soon think so; since Instruments easily got, even though they should in some things be inferior to others, do, by making Men's Labours easie and pleasant, exceedingly contribute to encrease their Industry, and excite their Emulation. But to say more upon these Subjects, would be to abuse Men's Patience, since these things are so plain, that they need no Proof.

Engraving

Engraving upon Wood, or Copper, is of great Use in all those Parts of Knowledge where the Imagination must be assisted by sensible Images. For want of this noble Art, the *Ancient Books of Natural History*, and *Mechanical Arts*, are almost every where obscure, in many places unintelligible. *Mathematical Diagrams*, which need only a Ruler and a Pair of Compasses, have been better preserved, and could with more Ease be drawn: But in *Anatomy*, in *Mechanics*, in *Geography*, in all Parts of *Natural History*, *Engraving* is so necessary, and has been so very advantageous, that without it, many of those Arts and Sciences would to this hour have received very little Encrease. For when the Images, the Proportions, and the Distances of those Things wherein a Writer intends to instruct his Reader, are fully and minutely engraven in Prints, it not only saves abundance of Words, by which all Descriptions must of necessity be obscured, but it makes those Words which are used, full and clear; so that a skilful Reader is thereby enabled to pass an exact Judgment, and can understand his Authors without a Master, which otherwise it would be impossible to do, so as to be able to discern all, even the minutest Mistakes and Oversights in their Writings, which

which puts an end to Disputes, and en-
creases Knowledge.

These are general Instruments, and more
or less serviceable to all sorts of Learned
Men in their several Professions and Sci-
ences: Those that follow, are more par-
ticular: I shall begin with those that assist
the Eye, either to discern Objects that are
too far off, or too small.

The *Imperfections of Distance* are re-
medied in a great measure by *Telescopes*,
whose chief Use, that comes under our
Consideration, is to discern the Stars, and
other Celestial Bodies.

To find out the first Inventor of these
sorts of Glasses, it will be necessary to
learn who first found out the Properties
of Convex and Concave Glasses in the
Refraction of Light. Dr. Plot has collected
a great deal concerning F. Bacon, in his
Natural History of Oxfordshire; which
seems to put it out of doubt, that he knew
that great Objects might appear little,
and small Objects appear great; that di-
stant Objects would seem near, and near Ob-
jects seem afar off, by different Applications
of Convex and Concave Glasses; upon
the Credit of which Authorities, Mr. Mo-
lineux (m) attributes the Invention of
Spectacles to this learned Friar, the Time
to which their earliest Use may be traced,
agreeing

(m) *Diop-
tric*. p. 256,
257, 258.

agreeing very well with the Time in which he lived; but how far *F. Bacon* went, we know not: So that we must go into *Holland* for the first Inventors of these excellent Instruments, and there they were first found out by one *Zacharias Joannides* (n), a Spectacle-maker (o) of *Middleburgh*, in *Zeland*; in *MDX* he (p) presented a Telescope of Two Glasses to Prince *Maurice*, and another to Arch-Duke *Albert*, the former of whom apprehending that they might be of great Use in War, desired him to conceal his Secret. For this Reason, his Name was so little known, that neither *Des Cartes* (q) nor *Gerhard Vossius* (r) had ever heard any thing of him, when they attributed the Invention of Telescopes to *Jacobus Metius* of *Alkmaer*. However, the Invention taking Air, *Galileo Galilei* pursued the Hint, and made several Telescopes, with which he made Observations upon Heavenly Bodies, that got him immortal Honour. Thereby (s) he discovered Four Planets moving constantly round *Jupiter*, from thence usually called his *Satellites*, which afterwards were observed to have a constant, regular, and periodical Motion. This Motion is now so exactly known, that Mr. *Flamsteed*, who is one of the most accurate Observers that ever

was,

(n) *Borel. de vero Inventore Telescopii*, p. 30.

(o) *Ibid.* p. 35.

(p) *Ibid.* p. 30.

(q) *Dioptric.*

(r) *De Scientiis Mathematicis*. p. 70.

(s) Vide *Galilei Nuntium sidereum primum nuntius, impressum, A. D. MDCVIII.*

was, has been able to calculate Tables of the Eclipses of the several Satellites, according to which, Astronomers in different Quarters of the World, having Notice of the precise Time when to look for them, have found them to answer to his Predictions, and published their Observations accordingly. This is an effectual Answer

to all that Rhapsody which *Stubbe* (t) has collected in his Brutal Answer to Mr. *Glanville's Plus Ultra*, about the Uncertainty of all Observations made by Telescopes; since it is impossible to calculate the Duration of any Motion justly by fallacious and uncertain Methods. By the Eclipses of *Jupiter's* Satellites, Longitudes would soon be exactly determined, if Tubes of any Length could be managed at Sea.

(u) But *Jupiter* is not the only Planet about which Things anciently unknown have been revealed by this noble Instrument. The Moon has been discovered to be an Earth enclosed with a libratory Motion, of an uneven Surface, which has something analogous to Hills and Dales, Plains and Seas; and a New Geography, (if one may use that Word without a Blunder) with accurate Maps, has been

Published by the Great *Hævelius* (w), and Improved by *Ricciolus* (x), by which Eclipses may be observed much more

nicely

(t) *Plus Ultra* reduced to a Non plus, p. 28, 36.

(u) Vid. *Philosoph. Transact.* n. 177.

(w) *Sele-nograph.*
(x) *Almagest.*

nicely than could be done formerly : The Sun has been found to have Spots at some times ; the Planets to move round their Axes ; *Saturn* to have a Luminous Ring round about his Body, which in some Positions appears like two Handles, as they are commonly called, or large Prominencies on opposite Parts of his Limb, carried along with him, beside Five Planets moving periodically about him, as those others do about *Jupiter* : The milky Way, to be a Cluster of numberless Stars ; the other Parts of the Heaven, to be filled with an incredible Number of Fixed Stars, of which, if *Hevelius's* Globes are ever published, the World may hope to see a Catalogue. These are some of the remarkable Discoveries that have been made by *Telescopes* : And as New Things have been revealed, so Old ones have been much more nicely observed, than formerly it was possible to observe them.

But I need not enlarge upon particular Proofs of that, which every Astronomical Book, printed within these $\overline{\text{L}}$ Years, is full of ; if I should, it would be said, perhaps, that I had only copied from the *French* Author of the *Plurality of Worlds*, so often mentioned already.

As some Things are too far off, so others are too small to be seen without help,

help. This last Defect is admirably supplied by *Microscopes*, Invented by the same *Zacharias Joannides* (y); which have been made useful in *Anatomical* and *Physical* Enquiries by *Malpighius*, *Leeuwenhoek*, *Grew*, *Havers*, and several others. The first considerable Essay to shew what might be discovered in Nature, by the help of *Microscopes*, was made by *Dr. Hook*, in his *Micrography*; wherein he made various Observations upon very different sorts of Bodies. One may easily imagine what Light they must needs give unto the nicer Mechanism of most kinds of Bodies, when *Monfieur Leeuwenhoek* has plainly proved, that he could, with his Glasses, discern Bodies several Millions of times less than a Grain of Sand. This Assertion of his, how incredible soever it may seem to those who are unacquainted with *Physical* Matters, may in all probability be believed, because *Dr. Hook*, who examined what *Leeuwenhoek* says of the little Animals which he discerned in Water, of which he tells the most wonderful Things, does, in his *Microscopium*, attest the Truth of *Leeuwenhoek's* Observations.

(y) Borel-lus, ubi supra, p. 35.

Besides these that are of more universal Use, several other Instruments have been invented, which have been very serviceable

viceable to find out the Properties of Natural Bodies ; and by which several Things of very great moment, utterly unknown to the Ancients, have been detected. As,

(2) Borelius de Motu Animalium, Part II. Propos. clxxv.

(1.) The *Thermometer*, invented by *Sanctorius*, an eminent Physician of *Padua*. Its immediate Use is, to determine the several Degrees of Heat and Cold ; of which our Senses can give us but uncertain Notices, because they do not so much inform us of the State of the Air in it self, as what its Operations are at that time upon our Bodies. But *Sanctorius* used only Vessels open at each end, which are of small Use, since Liquors may rise or fall in the Tubes, as well from the Encrease or Diminution of the Weight of the Air, as of Heat and Cold. That Defect was remedied by Mr. *Boyle* (a), who sealed up the Liquors in the Tubes, Hermetically, so that nothing but Heat and Cold could have any Operation upon them. The Uses to which they have been applied, may be seen at large in Mr. *Boyle's History of Cold*, and the *Experiments of the Academy del Cimento*.

(b) See his *Thermometrical Thoughts*, prefixed to his *History of Cold*.

(2.) The *Baroscope*, or *Torricellian Experiment*, so called from its Inventor, *Evangelista Torricelli*, a *Florentine Mathematician*, who, about the Year *MDCXLIII*

found

found that Quick-silver would stand erect in a Tube, above XXVIII Inches from the Surface of other Quick-silver into which the Tube was immersed, if it was before well purged of Air. This noble Experiment soon convinced the World, that the Air is an actually heavy Body, and gravitates upon every Thing here below. This Gravitation being found unequal at several times, Mr. Boyle applied this Instrument to Mechanical Uses (*b*), and shewed how it might teach us to know the Differences and changes of Weather; when dry, and when wet; since, by a vast Number of Observations, he had learn'd, that in dry Weather the Air drove up the Mercury, and in wet Weather let it fall again; though never lower than XXVIII Inches, and scarce ever higher than XXXII.

(*b*) *Philos. Transact.*
n. 9, 10,
11, --55.

(3.) These Observations, with other Collateral Experiments, induced him to believe that the Air was, in truth, a Springy Body, which expanded or contracted it self in a Reciprocal Proportion, to the Encrease or Lessening of the Compression of the Ambient Bodies. For which he invented an Instrument to draw the Air out of Vessels that were filled with it, by Suction. The first Essays of that kind seem to have been made some Years

before his appeared, by *Otto Guericke* of *Magdebourg*: but as he applied them chiefly to the Gravitation of the Air, without taking any notice of its Spring; so they were very imperfect, when compared to Mr. *Boyle's*. By this *Air-Pump*, as it is usually called, he discovered abundance of Properties in the Air, before never suspected to be in it. What they are, either considered singly, or in their Operations upon all sorts of Bodies, may be seen at large in his *Physico-Mechanical Experiments concerning the Weight and Spring of the Air*, and in several of his other Discourses upon the same Argument, some of which are printed by themselves, and

(c) Numb. 62, 63, 122.
Vid. Catalogue of Mr.
Boyle's Works, at the end
of the First Part of the
Medicinal Experiments,
printed MDCXCII. in
Twelves.

others in the (c) *Philosophical Transactions*. How far they may be relied upon, appears from this; That though *Hobbes* and *Linus* have taken a great deal of Pains to destroy Mr. *Boyle's* Theory, yet they have had few or no Abettors: Whereas the Doctrine of the Weight and Spring of the Air, first made thoroughly intelligible by Mr. *Boyle*, has universally gained Assent from Philosophers of all Nations who have, for these last xxx Years, busied themselves about Natural Enquiries.

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a O

(4.) The

(4) The Invention of *Pendulum-Clocks* ought here to be remembred, because, it being certain from Astronomical Principles, and Observations, that the Diurnal Motion of the Earth is not so exactly Periodical, as that a true Equation of Time can thereby be obtained: By this Instrument, the Measure of the Variation being once adjusted, the true Time of the Earth's Diurnal Motion, can, at all Seasons of the Year, be more exactly known. Its Usefulness in making Astronomical Observations is also very obvious; for they could not anciently be so minute as they are at present, for want of such nice Sub-Divisions of an equable Motion as it affords. The Invention of this noble Instrument is attributed, by the Publisher of the Experiments of the Academy del Cimento, to *Galileo Galilei*, who found out so many excellent Theorems of the Nature and Proportions of the Motions of Projected and Vibrating Bodies. He says that *Galileo* first applied the *Pendulum to Clock-work*; and that his Son *Vincenzio* put it in practice in the Year MDCXLIX (d). It was little taken notice of, however, in these Parts, till Monsieur *Huygens* revived or invented it a-new; to whom, for that Reason, the Glory of finding out this useful Instrument is commonly attributed.

(d) Experiments of the Academy del Cimento, p. 12. Eng. Edit.

Upon this Occasion, I ought not to omit, that great Improvement of Watches, by adding a Second Spring to balance the First, (as the *Pendulum* in a Clock does the Weights) which also is attributed to Monsieur *Huygens*, tho' he and Dr. *Hook* have both contended for the Honour of this useful Invention. It appears by the *Philosophical Transactions*, and by Dr. *Hook's Lectures*, that he had a right Notion of this Matter, and that he had made several Essays to reduce it to Practice, some Years before any of Monsieur *Huygens's* Watches were produced; but that Monsieur *Huygens* first made *Pendulum-Watches* (so they are commonly call'd) that proved thoroughly serviceable. These will not be disputed to be Modern Inventions, since the whole Business of Clocks and

(e) See Dr. *Edw. Bernard's* Letter to Dr. *Huntingdon*, about the Latitude of Twenty Fixed Stars, from *Arabian Observat. Philosoph. Transact.* n. 159.

Watches was unknown to all, even the (e) *Arabian Antiquity*: Their Astronomers measured their Time by Hour-Glasses of Water, or Vibrating Strings of several Lengths; which would, indeed, serve them, in most cases, to measure Time nicely by, whilst they were observing; though they were of no Use upon other Occasions, and even then were liable to great Hazards.

CHAP. XVI.

Of Ancient and Modern Chymistry.

Chymistry, or the Art of Dividing Bodies by Fire, comes next to be considered. So great Things have thereby been discovered in Nature, that would have been utterly unknown without it, that it may justly be esteemed as one of the chiefest Instruments whereby Real Knowledge has been advanced. It has been cultivated by three sorts of Men, for very different Reasons; by *Refiners*, *Alchymists*, and *Chymists* properly so called. The *Refiner's* Art, which is older than the Flood, is, in *Holy Scripture*, ascribed to *Tubal-Cain*, as its first Inventor (f). The early Use of (f) Gen. Gold and Silver, as Instruments of Ex-iv. 22. change in Trade, and of Copper and Iron for Mechanical Uses, in the Eastern Parts, shews, that Men soon knew how to separate Metals from their Dross, to a great degree. And as frequent Purifications are necessary for that Work, so we find that the Necessity of them was long ago commonly known, since *David* compared a Righteous Man to Silver Seven times purified in the Fire (g). But though the (g) Psal. Ancients knew pretty well how to Refine-xii. 6. their

their Metals, and to Extract them from their Ore's, in common Cases, where but one sort of Metal lay in the same Lump, or where the different Metals were easily separable; yet in nicer Cases, where many different Sorts were blended in the same Mass, and where the Metal was obstinately mixed in Stones, over which the Fire could have but small Power, both which Cases do not unfrequently occur, they were often at a loss; and besides, being wholly ignorant of the Use of *Quick-silver* in separating Metals from their Ore's, and of *Aqua-Fortes*, and the *Cupel*, by which all manner of Metals are with Ease parted from one another, their Work was laborious, bungling, and many times imperfect. Gold, indeed, which is generally found alone, might be thoroughly purified; which Silver could not be, without great Difficulty and Loss: Whereas now, since the Property of *Quick-silver's* incorporating with all Metals but Copper and Iron is universally known, every Workman in the *Peruvian* Mines understands that when once his Ore is duly prepared, every Particle of the Silver will *amalgamate* (as the Chymists call it) with the Mercury, and so make a Paste that gives him all his Metal without any trouble; and if it is mixed with Gold,

Aqua-

Aqua-Regis, will part them; if with Copper, *Aqua-Fortis*; if with Lead, the *Cupel*. Nor ought we to forget that useful Invention of turning Copper into Brass with *Lapis Calaminaris*, by which its Weight is considerably augmented, its Lustre heightened, and its Usefulness for many Mechanical Purposes encreased.

It must be own'd, that Skill in *Fossils*, and particularly in *Metals*, has not been cultivated by the *Moderns* proportionably with other Parts of *Natural History*. Yet what a Difference there must arise between their Knowledge and that of the *Ancients* from these few Things alone, is evident to any Man who has the least insight into these Matters. The *Ancients* were so grossly ignorant of the commonest Properties of Mercury, that they only knew that it would incorporate with Gold. We know, from *Vitruvius* and

Pliny, that this Property of Mercury was formerly observed; and *Pliny* (h) adds, That every thing swims upon Mercury but Gold; that only it draws to it self. And how well they were skill'd in the Specific Weight of Metals, appears from their believing (i) that Lead was heavier, and more ductile

(h) *Omnia ei [Mercurio] innatant præter Aurum; id unum ad se trahit. Plin. Nat. Hist. l. xxxiii. c. 6.*

(i) *Nec pondere aut facilitate materia prælatum est [Aurum] cæteris metallis, cum sedat per utrumque Plumbo. Plin. Nat. Hist. l. xxxiii. c. 3.*

than

(k) Borri-
chius de
Ortu &
Progressu
Chemiæ.

than Gold. The Use and Composition of *Aquæ-Fortes* is ascribed to the *Arabs*, by the Learned in these Matters; (k) and the *Cupel* is notoriously known to be a Modern Invention. So that I think we may boldly compare the Modern Writers of Metals with the best of the Ancients, of whose Skill in these Things *Pliny* gives us a good Account, whose Writings may be set against what *Georgius Agricola*, *Alonso Barba*, *Lazarus Erckern*, and our Countrey-man *Webster*, have said upon these Subjects; in whose Writings, Skill in Distinguishing, Purifying, Separating and Assaying Ore's and Metals, is what is chiefly to be regarded. These Things depend upon Observation and Experience, which is certain, and consequently will admit of comparison, since it may easily be decided, whose Trials and Observations of any sort have been the most Exact. It signifies nothing whose Hypotheses of the Nature, Texture, Growth, and Possibility of the Transmutation of Metals, be rightest, in the Dispute before us. Men may eternally, and will dispute *pro* and *con* about those Things which will, in all probability, lie undetermined, till either we know the Essences of Things, (which, perhaps, are not to be known in this Life,) or till Mankind be furnished with
a larger

a larger stock of Experiments and Observations than yet they are. So that though several of the Modern Writers of Metals that might be named, if Show and Ostentation were proper, give very poor Accounts of the Physical Nature of Minerals, yet their Experiments and Observations are never a whit the less valuable; and others who seem to Philosophize much nearer the Truth, yet are not here to be esteemed Advancers of the Stock of Knowledge upon the score of their Hypotheses; because what is still contested, is not to be given in as Evidence, especially when the Cause does not want it.

I have spoken already of *Alchymy*, or the Art of Making Gold; and so I shall pass on to the *Chymist's Art*, which consists in making such Analyses of Bodies by Fire, or other Agents, Chymically prepared, as may reduce them into more simple Substances than those out of which they were before compounded. I make a difference between the *Chymist* and the *Refiner*; because the Operations of the *Chymist* are employ'd about making useful Medicines, or Philosophical Experiments; whereas the Disquisitions of the *Refiner* terminate altogether in finding out ways how to part his Metals from their Ore's, and from one another, and to purifie them
from

from their Dross. The Discoveries therefore which have been made by Chymistry properly so called, are so much later than those Ages which Sir William Temple contends for, that those who thought they had a great deal to say for the other Parts of Chymistry, do here give up the Controversie. *Borrichius* himself owns, that *Hippocrates*, *Aristotle* and *Galen* knew so little of Chymistry, that they could not so much as make *Rose-Water*. Now, though he says this, with a design to Disparage their Skill in Physic, when compared with the *Aegyptian*, yet therein he destroys his own Hypothesis; because, in several Places of his *Vindication of the Hermetical and Chymical Philosophy and Medicine*, against *Conringius's* Book *de Medicina Hermetica*, he takes Pains to prove, that the Knowledge of these very Men was originally owing to the *Aegyptians*. But the Thing speaks it self: The Inward Use of Antimonial, Vitriolic and Mercurial Preparations in Physic, was but little known before the Time of *Basilus Valentinus*, and *Paracelsus*: What was ancients, was taken from the *Arabs*, who are Moderns against Sir William Temple. (1) They may be looked upon as the first Inventors of Chymical Medicine: (1) They first extracted Virinous Spirits from Fermented Liquors:

Not

(1) *Borrichius de Orru & Prog. Chem. Morhofius ad Langelottum.*

Not to mention abundance of other Preparations, which *Arnoldus de Villa Nova*, *Raymund Lully* his Scholar, and *F. Bacon* learned from them. I will not deny but some Chymical Experiments were very anciently known. *Salomon* (m) hints at the Disagreement of *Vinegar* and *Nitre*; which, though not intelligible of common *Nitre*, yet as *Mr. Boyle* (n) found by his own Experience, it is certainly true of *Egyptian Nitre*; which, as being a natural *Alkali*, will cause an Ebullition, when joined with any Acid Salt.

(m) *Prov.*
XXV. 20.
(n) *Boyle's*
Productive-
ness of Chy-
mical Prin-
ciples, p.
30, 31.

Some Passages likewise are produced by *Barkius*, to prove that the Ancients understood something of Calcinations, and the Use of Lixivate Salts: But these things are very few, very imperfect, and occasional. Chymistry was not esteemed as a distinct Art; or the Analyses thereby produced, worthy a Philosopher's notice; though the Industry of later Ages have found them to be so regular and remarkable, that many Persons have thought that the Constituent Principles of Mixed Bodies, are no other way so certainly to be found out. Hence have the *Hypotheses* of the *Paracelsians* taken their Beginning, who held, that *Salt*, *Sulphur* and *Mercury* were the Active Principles of Composition of all Mixed Bodies.

Hence

(o) Scepti-
cal Chymist,
and Produ-
cib. of Chy-
mical Prin-
ciples.

Hence several others have been led to believe, that the Primary Constituents of most Bodies were *Acid* and *Alkalizate Salts*. Which Hypotheses, though liable to many Exceptions, as Mr. Boyle (o) has fully proved, are founded upon such a variety of surprizing Experiments, that those who first started them, were not so unadvised, as one that is wholly unacquainted with the Laboratories of the *Chymists*, might, at first view, suspect. For it is certain, that Five distinct and tolerably uniform Substances may be drawn from most Vegetable and Animal Substances, by Fire; *Phlegm*, *Fixed Salt*, *Oil*, *Earth*, and *Spirit*, or *Volatile Salt* dissolved in *Phlegm*. So that here is a new Field of Knowledge, of which the Ancients had no sort of Notion.

(p) See
Mr Boyle's
Usefulness
of Experi-
mental Phi-
losophy.

The great and successful Change hereby made (p) in the *Pharmaceutical* Part of Physic, shews that these Philosophers, by Fire, have spent their Time to very good purpose. Those Physicians who reason upon *Galenical* Principles, acknowledge, that in many Cases, the *Tinctures*, *Extracts*, *Spirits*, *Volatile Salts*, and *Rosins* of Vegetables and Animals, are much more efficacious Remedies than the *Galenical* Preparations of those self-same Medicines. Nay, though they are not easily reconciled

ciled to Mineral Preparations, because the Ancients not knowing how to separate them from their grosser *Fæces*, durst seldom apply them to any but Chirurgical Uses; yet they themselves are forced to own, that some Diseases are of so malignant a Nature, that they cannot be dispelled by milder Methods. The Use of *Mercury* in Venereal Distempers, is so great, and so certain, that if there be such a Thing as a Specificall Remedy in Nature, it may justly deserve that Title. The Unskilfulness of those who have prepared and administred *Antimonial* Medicines, has made them infamous with many Persons, though many admirable Cures have been, and are wrought by them, skilfully corrected, every Day. And it is well known, that the Inward Use of *Steel* has been so successful, that in many Diseases, where the nicest Remedies seem requisite, whether the Constitution of the Patients, or the Nature of the Distempers, be considered, it is, without Fear, made use of; though its Medicinal Vertues, in these Cases, have been found out by Chymical Methods.

Upon the whole Matter, it is certain, that here is a new and gainful Acquisition made: The old *Galenical Materia Medica* is almost as well known, in all probability,

lity, as ever it was; since there are so great Numbers of Receipts preserved in the Writings of the old Physicians. The Industry of Modern Naturalists has, in most, at least in all material Cases, clearly discovered what those Individual Remedies are, which are there described. So that whatsoever Enlargement is made, is a clear Addition; especially, since these Minerals and Metals were then as free and common as they are now. Besides, vast Numbers of *Galenical* Medicines, Chymically prepared, are less nauseous, and equally powerful; which is so great an Advantage to Physic, that it ought not to be overlooked.

CHAP. XVII.

Of Ancient and Modern Anatomy.

Anatomy is one of the most necessary Arts to open to us Natural Knowledge, of any that was ever thought of. Its Usefulness to Physicians was very early seen; and the *Greeks* took great Pains to bring it to Perfection. Some of the first Dissectors (q) tried their Skill upon living Bodies of Men, as well as Beasts. This

(q) Vide
Corn. Cel.
sum in Pre-
fatione.

was so inhumane and barbarous a Custom, that it was soon left off. And it created such an abhorrence in Men's Minds of the Art it self, that in *Galen's* time, even dead Bodies were seldom opened; and he was often obliged (r) to use Apes, instead of Men, which sometimes led him into great Mistakes.

(r) *Anatom. Administ. passim.*

It may be said, perhaps, that because there is not an ancient System of Anatomy extant, therefore the Extent of their Knowledge in this Particular cannot be known. But the numerous Anatomical Treatises of *Galen* do abundantly supply that Defect. In his elaborate Work of *the Uses of the Parts of Humane Bodies*, he gives so full an Idea of ancient Anatomy, that if no other ancient Book of Anatomy were extant, it alone would be sufficient for this Purpose. He is very large in all his Writings of this kind, in taking Notice of the Opinions of the Anatomists that were ancients than himself, especially when they were mistaken, and had spent much Time and Pains in Opening Bodies of Brutes, of which he somewhere promises to write a Comparative Anatomy. So that his Books not only acquaint us with his own Opinions, but also with the Reasonings and Discoveries of *Hippocrates*, *Aristotle*, *Herophilus* and

P

Eras-

Erasistratus, whose Names were justly Venerable, for their Skill in these Things. Besides, he never contradicts any body, without appealing to Experience, wherein though he was now and then mistaken, yet he does not write like a Pedant, affirming a thing to be true or false, upon the Credit of *Hippocrates*, or *Hierophilus*, but builds his Arguments upon Nature, as far as he knew her. He had an excellent Understanding, and a very piercing Genius; so that the false Uses which he frequently assigns to several Parts, do certainly shew that he did not understand the true Texture of those Parts; because where his Anatomy did not fail him, his Ratiocinations are generally speaking exact. Wherefore, in this Particular, his Mistakes instruct us as effectually in the Ancients Ignorance, as his true Notions do in their Knowledge. This will appear at large hereafter, where it will be of mighty use to prove, That the Ancients cannot be supposed to have known many of the most eminent Modern Discoveries; since if they had known them, they would not have assigned such Uses to those Parts, as are not reconcilable to those Discoveries. If *Galen* had known that the *Pancreas* had been a Heap of small Glands, which all emit into one common Canal, a particular

cular Juice carried afterwards through that Canal into the Guts, which there meeting with the Bile goes forward, and assists it in the making of the Chyle, he would never have said (s) that Nature made it for a Pillow to support the Veins, which go out of the Liver in that Place, where they divide into several Branches, lest if they had been without a Rest, they should have been hurt by the violent Eruption of the Blood; and this too, without assigning any other Use for it.

(s) De Usu
Partium,
lib. vi. c. 2.

By *Anatomy*, there is seldom any thing understood but the Art of laying open the several Parts of the Body with a Knife, that so the Relation which they severally bear each to other may be clearly discerned. This is generally understood of the containing Parts, Skin, Flesh, Bones, Membranes, Veins, Arteries, Muscles, Tendons, Ligaments, Cartilages, Glands, Bowels, wherein only the Ancients busied themselves: As for the Examination of the Nature and particular Texture of the contained Parts, Blood, Chyle, Urine, Bile, Serum, Fat, Juices of the Pancreas, Spleen and Nerves, Lympha, Spittle, Marrow of the Bones, Mucilages of the Joints, and the like; they made very few Experiments, and those too, for want of Chymistry and Microscopes, very imperfect.

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fect. The Discoveries therefore which have been made in that nobler Part, which are numerous and considerable, are in a manner wholly owing to later Ages. In the other, a great deal was anciently done, though a great deal more was left for Posterity to do.

I shall begin with the Body in general. It is certain, that all the great Divisions of the Bones, Muscles, Veins and Arteries, most of the visible Cartilages, Tendons and Ligaments, were exactly known in *Galen's* time; the Positions of the Muscles, their several Originations, the Insertions of their Tendons, and investing Membranes, were, for the most part, traced with great Nicety and Truth; the more conspicuous Pairs of Nerves which arise either from the Brain or Spinal Marrow, were well known, and carefully followed; most of the great Branches of the Veins and Arteries, almost all the Bones and Cartilages, with very many Muscles, have still old *Greek* Names imposed upon them by the Old Anatomists, or *Latin* Names translated from the *Greek* ones: So that, not only the easie things, and such as are discernible at first sight, were thoroughly known; but even several Particulars, especially in the Anatomy of the Nerves, were discovered, which are not obvious without

great

great Care, and a good deal of Practical Skill in Dissecting. So much in general; from which it is evident, that as far as Anatomy is peculiarly useful to a Surgeon, to inform him how the Bones, Muscles, Blood-Vessels, Cartilages, Tendons, Ligaments and Membranes, lie in the Limbs, and more conspicuous Parts of the Body, so far the Ancients went; And here, there is very little that the Moderns have any Right to pretend to, as their own Discovery; tho' any Man that understands these things, must own, That these are the first things which offer themselves to an Anatomist's View.

Here I shall beg leave to descend to Particulars, because I have not seen any Comparison made between *Ancient and Modern Anatomy*, wherein I could acquiesce; whilst some, as Mr. Glanville (t), and some others who seem to have copied from him, have allowed the Ancients less than was their Due; others, as *Vander Linden*, and *Almeloveen* (u), have attributed more to them than came to their Share; especially since (though perhaps it may be a little tedious, yet) it cannot be called a Digression.

Hippocrates (w) took the Brain to be a Gland. His Opinion was nearer to the Truth than any of his Successors; but he

(t) *Essay* of Modern Improvements of Useful Knowledge.

(u) *Inventa Nov. Antiqua.*

(w) *De Glandulis*, pag. 418. S. 7. Edit. *Vander Linden.*

seems to have thought it to be a *limina* Substance, which it evidently is not. And therefore, when several Parts of It were discovered not to be glandulous, his Opinion was rejected. *Plato* took it to be Marrow, such as nourishes the Bones; but its Weight and Texture soon destroyed his Notion, since it sinks in Water where in Marrow swims; and is hardened by Fire, by which the other is melted. *Galen* (x) saw a little farther, and asserts it to be of a Nervous Substance, only something softer than the Nerves in the Body. Still they believed that the Brain was an Uniform Substance, and as long as they did so, they were not like to go very far. The first Anatomist who discovered the true Texture of the Brain, was *Archangelus Piccolomithens* (y) an *Italian*, who lived in the last Age. He found that the Brain properly so called, and *Cerebrum*, consist of Two distinct Substances, an outer Ash-coloured Substance, through which the Blood-Vessels, which lie under the *Pia Mater* in innumerable Folds and Windings, are disseminated; and an inner every where united to it, of a Nervous Nature, that joins this *Bark* (as it is usually call'd) to the *Medulla Oblongata*, which is the Original of all the Pairs of Nerves that issue from the Brain, and

(x) *De Usu Partium*, lib. viii. cap. 6.

(y) *Malpighius Epist. de Cerebro ad Fracassatum*, p. 2.

and of the Spinal Marrow, and lies under the Brain and *Cerebellum*. After him, Dr. *Willis* (z) was so very exact, that he (z) *Anat. Cerebri.* traced this Medullar Substance through all its Insertions into the Cortical, and the *Medulla Oblongata*, and examined the Rises of all the Nerves, and went along with them into every Part of the Body with wonderful Curiosity. Hereby not only the Brain was demonstrably proved to be the Fountain of Sense and Motion, but also by the Courses of the Nerves, the Manner how every Part of the Body conspires with any others to procure any one particular Motion, was clearly shewn; and thereby it was made plain, even to Sense, that where-ever many Parts joined at once to cause the same Motion, that Motion is caused by Nerves that go into every one of those Parts, which are all struck together. And tho' *Vieussens* and *du Verney* have in many things corrected Dr. *Willis's Anatomy of the Nerves*; yet they have strengthened his general Hypothesis, even at the time when they discovered his Mistakes, which is the same thing to our present purpose. *Galen* (a) indeed, had a right Notion of (a) *De U. P. l. 8. c. 4.* this Matter, but he traced only the larger Pairs of Nerves, such as could not escape good Anatomist.

(b) De Cerebri Cortice.

(c) De Cerebro, pag. 4.

(d) Galen de U. P. l. viii. c. 2.

But the Manner of the Forming of the *Animal Spirit* in the Brain, was wholly unknown. In order to the Discovery whereof, *Malpighius* (b), by his Microscopes, found that the Cortical Part of the Brain consists of an innumerable Company of very small Glandules, which are all supplied with Blood by Capillary Arteries ; and that the Animal Spirit, which is separated from the Mass of the Blood in these Glandules, is carried from them into the *Medulla Oblongata* thorough little Pipes, whereof one belongs to every Gland, whose other End is inserted into the *Medulla Oblongata*, and that these Numberless Pipes, which in the Brain of some Fishes look like the Teeth of a small Ivory Comb (c), are properly that which all Anatomists after *Piccolominius* have called the *Corpus Callosum*, or the Medullar Part of the Brain. This Discovery destroys the Ancient Notions of the Uses of the Ventricles of the Brain, and makes it very probable, that those Cavities are only Sinks to carry off excrementitious Humours, and not Store-Houses of the Animal Spirit : It shews likewise how little they knew of the Brain, who Believed that it was an uniform Substance. Some of the Ancients disputed (d) whether the Brain were not made

made to cool the Heart. Now, though these are ridiculed by *Galen*, so that their Opinions are not imputable to those who never held them; yet they shew, that these famous Men had examined these things very superficially: For no Man makes himself ridiculous if he can help it; and now, since Mankind are satisfied, by Ocular Demonstration, that the Brain is the Original of the Nerves, and the Principle of Sense and Motion, he would be thought out of his Wits, that should doubt of this Primary Use of the Brain; though formerly, when things had not been so experimentally proved, Men might talk in the dark, and assign such Reasons as they could think of, without the Suspicion of being ignorant or impertinent.

The Eye is so very remarkable a Member, and has so many Parts peculiar to it self, that the Ancients took great Notice of it. They found its Humours, the Watry, Crystalline, and Glassy, and all its Tunicles, and gave a good Description of them; but the Optic Nerve, the Aqueous Ducts which supply the Watry Humour, and the Vessels which carry Tears were not sufficiently examined. The first was done by Dr. *Briggs* (e), who has found, that in the *Tunica Retiformis*, which is contiguous to the Glassy Humour,

(e) Theory of Vision.
Grew's
Transact.
numb 6.
and Philos.
Transact.
numb. 147.

the

the Filaments of the Optic Nerve there expanded, lie in a most exact and regular Order, all parallel one to another; which when they are united afterwards in the Nerve, are not shuffled confusedly together, but still preserve the same Order till they come to the Brain. The Crystalline Humour had already been discovered to be of a Double-Convex Figure, made of Two unequal Segments of Spheres, and not perfectly Spherical, as the Ancients thought. So that this further Discovery made by Dr. Briggs, shews evidently why all the Parts of the Image are so distinctly carried to the Brain, since every Ray strikes upon a several Filament of the Optic Nerve; and all those Strings so struck, are moved equably at the same time. For want of knowing the Nature and Laws of Refraction, which have been exactly stated by Modern Mathematicians, the Ancients discoursed very lamely of Vision. This made *Galen* think that the Crystalline Humour (f) was the Seat of Vision, whereas its only Use is, to refract the Rays; as the common Experiment of a dark Room, with one only Hole to let in Light, plainly proves: For if one puts a Convex Glass within it, so as to suffer no light to be let in but thorough that Glass, a most exact Land-skip

(f) De Usu
Partium,
lib. viii.
cap. 6.

of every thing without, in their proper Colours, Heights and Distances, will be represented upon a Paper placed in the Focus of the Glas: And it is well known, that the same thing will appear, if the Crystalline Humour taken out of an Ox's or a Man's Eye, be placed in the Hole, instead of the Glas. The Way how the Watry Humour of the Eye, when by Accident lost, may be and is constantly supplied, was first found out and described by Monsieur *Nack* (g), who discovered a particular Canal of Water arising from the internal Carotidal Artery, which creeping along the Sclerotic Coat of the Eye, perforates the Cornea near the Pupil, and then branching it self curiously about the Iris, enters into and supplies the Watry Humour. As to the Vessels which moisten the Eye, that it may move freely in its Orbit, the Ancients knew in general, that there were Two Glands in the Corners of the Eyes (h); but the Lympheducts, through which the Moisture is conveyed from those Glands, were not fully traced till *Steno* (i) and *Briggs* (k) described them; so that there is just the same difference between our Knowledge and the Ancients in this Particular, as there is between his Knowledge who is sure there is some Road or

other

(g) De
Ductibus
novis A-
quosis.

(h) Galen
de U. P.
lib. x. c. ii.

(i) Obser-
vat. Ana-
tomica de
Oris Ocu-
lorum &
Narium
Vasis.

(k) Oph-
thalmogra-
phia.

other from this Place to that, and his who knows the whole Course, and all the Turnings of the Road, and can describe it on a Map.

The Instruments by which Sounds are conveyed from the *Drum* to the *Auditory Nerves* in the inner Cavities of the Ear, were very little, if at all, known to the Ancients. In the First Cavity there are Four small Bones, the *Hammer*, the *Anvil*, the *Stirrup*, and a small flattish Bone just in the Articulation of the *Anvil* and the *Stirrup*. It is now certainly known, that when the *Drum* is struck upon by the external Air, these little Bones, which are as big in an Infant as in adult Persons, move each other; the *Drum* moves the *Hammer*, That the *Anvil*, That the *Stirrup*, which opens the Oval Entrance into the Second Cavity: None of these Bones were ever mentioned by the Ancients, who only talked of Windings and Turnings within the *Os Petrosum*, that were covered by the large Membrane of the *Drum*. *Jacobus Carpus*, one of the first Restorers of Anatomy in the last Age, found out the *Hammer* and the *Anvil*; *Realdus Columbus* discovered the *Stirrup*; and *Franciscus Silvius*, the little flattish Bone, by him called *Os Orbiculare*, but mistook its Position; He thought

It had been placed Sideways of the Head of the *Stirrup*, whereas Monsieur du Verney (l) found that it lies in the Head of the *Stirrup*, between that and the *Anvil*. The other inner Cavities were not better understood, the Spiral Bones of the *Cochlea*, that are divided into Two distinct Cavities, like Two pair of Winding-Stairs parallel to one another, which turn round the same Axis, with the Three Semicircular Canals of the *Labyrinthus*, into which the inner Air enters, and strikes upon the small Twigs of the Auditory Nerves inserted into those small Bones, were things that they knew so little of, that they had no Names for them; and indeed, till Monsieur du Verney came, those Mazes were but negligently, at least unsuccessfully, examined by Moderns, as well as Ancients; it being impossible so much as to form an Idea of what any former Anatomists asserted of the wonderful Mechanism of those little Bones, before he wrote, if we set aside Monsieur Perrault's (m) *Anatomy* of those Parts, which came out a Year or two before, who is not near so exact as Monsieur du Verney.

(l) *Traité
del' Organe
de l'Ouye.*
Paris,
1683.

(m) *Essays
de Physique.*
Part II.

The other Parts of the Head and Neck, wherein the *Old Anatomy* was the most defective,

(n) Vide
Malpighi.
um de Lin-
gua.

defective, were the *Tongue*, as to its Internal Texture; and the *Glands of the Mouth, Jaws and Throat*. The Texture of the *Tongue* was but guessed at, which occasioned great Disputes concerning the Nature of its Substance, (n) some thinking it to be Glandulous, some Muscular, and some of a peculiar Nature, not to be matched in any other Part of the Body. This therefore *Malpighius* examined with his Glasses, and discovered, that it was clothed with a double Membrane; that in the inner Membrane there are abundance of small *Papillae*, which have extremities of Nerves inserted into them, by which the *Tongue* discerns Taste, and that under that Membrane it is of a Muscular Nature, consisting of numberless Heaps of Fibres, which run all manner of ways, over one another, like a Mat.

The general Uses of the *Glands of the Mouth, Jaws and Neck*, were anciently known; it was visible that the Mouth was moistened by them, and the Mass of the Spittle supplied from them; and then, having named them from the Places near which they lie, as the *Palate*, the *Jaws*, the *Tongue*, the *Ears*, the *Neck*, they went no further; and there was little, if any thing, more done, till

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Dr. Wharton and Nicolaus Steno examined these Glands. And upon an exact Enquiry, Four several Salival Ducts have been discovered, which from several Glands discharge the Spittle into the Mouth. The first was described by Dr. Wharton (e), (o) *Adenograph. c. 21.* near Forty Years ago; it comes from the Conglomerate Glands that lie close to the inner side of the lower Jaw, and discharges it self near the middle of the Chin into the Mouth. The Second was found out by Steno (p), who published his Observations in MDCLXII; this comes from those Glands that lie near the Ears, in the inside of the Cheek, and the outside of the Upper Jaw. The Third was found out by (q) Thomas Bartholin, (q) *Nuck Sialograph.* who gave an Account of it in MDCLXXXII, and about the same time by one Rivinus a German: It arises from the Glands under the Tongue, and going in a distinct Canal to the Mouth of Wharton's Duct, there, for the most part, by a common Orifice, opens into the Mouth. The Fourth was discovered by Monsieur Nuck (r); he found a Gland within the Orbit of the Eye, from which, not far from the Mouth of Steno's Duct, Spittle is supplied to the Mouth by a peculiar Canal. Besides these, the same Monsieur Nuck found some smaller Glands near

(p) *Observat. Anat. de Oris Vasis.*

(r) *Ibid.*

near the last, but lower down, which by Four distinct Pipes, carry some Spittle into the Mouth; so careful has Nature been to provide so many Passages for that necessary and noble Juice, that if some should fail, others might supply their Want.

CHAP. XVIII.

Of the Circulation of the Blood.

FROM the *Head*, we are to look into the *Thorax*, and there to consider the *Heart* and the *Lungs*. The *Lungs*, as most of the other *Viscera*, were believed to be of a *Parenchymous* Substance, till *Malpighius* found by his Glasses (s) that they consist of innumerable small Bladders, that open into each other, as far as the outermost; which are covered by the outer Membrane, that incloses the whole Body of the *Lungs*: And that the small Branches of the *Wind-Pipe* are all inserted into these Bladders; about every one of which the *Veins* and *Arteries* are entwined, in an unconceivable Number of Nets and Mazes; that so the inspired Air

may

(s) *Epist. de Pulmonibus.*

may press upon, or mix with, the Mass of Blood, in such small Parcels as the Ancients had no Notion of. The *Wind-Pipe* also it self is nourished by an *Artery* that creeps up the Back-side; and accompanies it in all its Branchings: Which was first found out by *Frederic Ruysch*, a *Dutch* Professor of *Anatomy* at *Leyden*, about Thirty Years ago.

But the great Discovery that has been made of the *Lungs*, is, That the whole Mass of Blood is carried out of the Right Ventricle of the Heart, by the *Arteria Pulmonaris*, called anciently *Vena Arteriosa*, thorough all the small Bladders of the *Lungs*, into the *Vena Pulmonaris*, (or *Arteria Venosa*;) and from thence, into the Left Ventricle of the Heart again. So that the Heart is a strong Pump, which throws the Blood, let in from the Veins, into the *Lungs*; and from the *Lungs*, afterwards, into the *Arteries*; and this by a constant rapid Motion, whereby the Blood is driven round several times in an Hour. This Discovery, first made perfectly intelligible by *Dr. Harvey*, is of so very great Importance to shew the Communication of all the Humours of the Body, each with other, that as soon as Men were perfectly satisfied that it was not to be contested, which they were in a few Years, a great many put in

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for the Prize, unwilling that Dr. *Harvey* should go away with all the Glory. *Vand Linden*, who published a most exact Edition of *Hippocrates*, in *Holland*, about XXX Years ago, has taken a great deal of Pains to prove that *Hippocrates* knew the Circulation of the Blood, and that Dr. *Harvey* only revived it. The Substance of what has

been said in this Matter, is this;

That *Hippocrates* speaks (x) in one place, of the Usual and Constant Motion of the Blood: That, in another place, he calls (u) the Veins and Arteries, the Fountains of Humane Nature, the Rivers that water the whole Body, and convey Life; and which, if they be dried up, the Man dies: That in a third place, he says (w) That the Blood-Vessels which are dispersed over the whole Body, give Spirit, Moisture and Motion, and all spring from one; which one (Blood Vessel) has no Beginning, no End, that I can find; for where there is a Circle, there is no Beginning. These are

the clearest Passages that are produced, to prove, that *Hippocrates* knew the Circulation

(x) Παράφρονέναν ἐν τῇ
νύσῳ διὰ παντός, ἅτε τὸ
αἷμα ἐφθαρμένον τε. καὶ
ἐκκαυτημένον ἢ ἐξωδυνῶν
κίνησιν. De Morbi, lib. 1.
§. 30. Edit. Vand.

(u) Ἀυταὶ πηγὰς φύσις
ἀνθρώπων, καὶ οἱ ποταμοὶ
ἐνταῦθα ἀνὰ τὸ σῶμα,
τοῖσιν ἀρεῖν τὸ σῶμα.
ἔστι δὲ καὶ ζῶν φέροντι πρὸς
ἀνθρώπων κτλ ἐναντίας
σιν ἀπέδωκεν ὁ ἀνθρώ-
πος. De Corde, §. 5.

(w) Αἱ φλέβες διὰ τὸ
σῶμα ἐκχυμέναι πνεύ-
μα, καὶ ρεύμα καὶ κίνησιν πα-
ρίχουσι. ἀπὸ μιᾶς πολλὰ
διακλασάνεσαι. καὶ αὐτὴ
μὲν ἡ μία, ὅθεν ἤρξε, καὶ
ἡ τετελεύτηκεν, καὶ οἶδα,
κύκλος γὰρ μετρημένος, ἀρ-
χὴ καὶ ἐντέλει. De Venis,
§. 17.

lation of the Blood; and it it plain from them, that he did believe it as an *Hypothesis*; that is, in plain *English*, that he did suppose the Blood to be carried round the Body by a constant accustomed Motion: But that he did not know what this constant accustomed Motion was, and that he had not found that Course which, in our Age, Dr. *Harvey* first clearly demonstrated, will appear evident from the following Considerations. (1.) He says nothing of the *Circulation of the Blood*, in his *Discourse of the Heart*, where he Anatomizes it as well as he could, and speaks of the (x) Ventricles, and the Valves (y), which are the immediate Instruments by which the Work is done. (2.) He believes that the Auricles of the Heart (z) are like Bellows, which receive the Air to cool the Heart. Now, there are other Uses of them certainly discovered, since they assist the Heart in the Receiving of the Blood from the *Vena Cava*, and the *Vena Pulmonaris*. This, no Man that knows how the Blood circulates, can be unacquainted with; and accordingly, would have been mentioned by *Hippocrates*, had he understood it. (3.) *Hippocrates* (a) speaks of Veins, as receiving Blood from the

(x) *De Corde*, § 4.
(y) *Ibid.* §. 7, 8.
(z) *Ibid.* §. 6.

(a) *Arteriae quidem purum sanguinem & spiritum à corde recipiunt; Venae autem & ipsae à corde sanguinem sumunt, per quas corpori distribuitur.* De *Structura Hominis*, §. 2.

Q 2

Heart,

Heart, and going from it : Which also was the constant way of Speaking of *Galen*, and all the Ancients. Now, no Man that can express himself properly, will ever say, That any Liquors are carried away from any Cistern, as from a Fountain or Source, through those Canals which, to his Knowledge, convey Liquors to that Cistern. (4) *Hippocrates* says, the Blood is carried into the Lungs, from the Heart, for the Nourishment of the Lungs; without assigning any other Reason (b).

(b) *De*
Corde, §. 1c.

These seem to be positive Arguments, that *Hippocrates* knew nothing of this Matter ; and accordingly, all his Commentators, Ancient and Modern, before *Dr. Harvey*, never interpreted the former Passages of the *Circulation of the Blood* : Neither would *Vander Linden*, in all probability, if *Dr. Harvey* had not helped him to the Notion ; which he was then resolved to find in *Hippocrates*, whom he supposed to be not the Father only, but the Finisher also of the whole Medical Art. It is pretended to by none of the Ancients, or rather their Admirers for them, after *Hippocrates*. As for *Galen*, any Man that reads what he says of the Heart and Lungs, in the Sixth Book of his *De Usu Partium*, must own, that he does not discourse as if he were acquainted with
Modern

Modern Discoveries ; and therefore it is not so much as pretended that he knew this Recurrent Motion of the Blood. Which also further shews, that if *Hippocrates* did know it, he explained himself so obscurely, that *Galen* could not understand him ; who, in all probability, understood *Hippocrates's* Text as well as any of his Commentators, who have written since the *Greek* Tongue, and much more, since the *Ionic* Dialect has ceased to be a living Language.

Since the Ancients have no Right to so noble a Discovery, it may be worth while to enquire, to whom of the Moderns the Glory of it is due ; for this is also exceedingly contested. The first Step that was made towards it, was, the finding that the whole Mass of the Blood passes thorough the Lungs, by the Pulmonary Artery and Vein.

The first that I could ever find, who had a distinct *Idea* of this Matter, was *Michael Servetus*, a *Spanish* Physician, who was burnt for *Arianism*, at *Geneva*, near *CXL* Years ago. Well had it been for the *Church of Christ*, if he had wholly confined himself to his own Profession ! His Sagacity in this Particular, before so much in the dark, gives us great Reason to believe, that the World might then have had just Cause to

(c) *Vitalis Spiritus in sinistro cordis ventriculo suam Originem habet, iuventibus maxime pulmonibus ad ipsius generationem. Est spiritus tenuis, coloris vi elaboratus, flavo colore, ignea potentia, ut sit quasi ex puriore sanguine lucidus vapor: generatur ex facta in pulmone mixtione inspirati aeris cum elaborato subtili sanguine, quem dexter ventriculus sinistro communicat. Fit autem communicatio hac non per parietem cordis medium ut vulgo creditur, sed magno artificio a dextro cordis ventriculo, longo per pulmones ductu, agitatur sanguis subtilis; a pulmonibus preparatur, flavus ejicitur, & a venâ arteriosa in arteriam venosam transfunditur; deinde in ipsâ arteriâ venosâ inspirato aëri miscetur & expiratione a fuligine repurgatur; atque ita tandem a sinistro cordis ventriculo totum mixtum per diastolen attrahitur, apta suppellex ut fiat spiritus vitalis. Servet. Christian. Restit.*

(d) Vid. Sandii Bibliothecam Anti-Trinitariorum, p. 13.

Realduſ Columbus, of *Cremona*, was the next that said any thing of it, in his *Anatomy*, printed at *Venice*, *MDLIX.* in *Folio* and

and at *Paris*, in MDLXXII. in *Ottavo*; and afterwards elsewhere. There he asserts the same (e) Circulation thorough the Lungs, that *Servetus* had done before; but says, that no Man had ever taken notice of it before him, or had written any thing about it: Which shews that he did not copy from *Servetus*; unless one should say, that he stole the Notion, without mentioning *Servetus's* Name; which is injurious, since in these Matters the same thing may be, and very often is observed by several Persons, who never acquainted each other with their Discoveries. But *Columbus* is much more particular; (f) for he says, That the Veins lodge the whole Mass of the Blood

(e) *Due insunt cordi cavitates, h. e. ventriculi duo; ex his alter à dextris est, à sinistris alter; dexter sinistro multò est major; in dextro sanguis adest naturalis, ac vitalis in sinistro: illud autem observatu perpulcrum est, substantiam cordis dex-*

trum ventriculum ambientem tenuem satis esse, sinistram vero crassam; & hoc tum aequilibrìi causà factum est, tum ne sanguis vitalis, qui tenuissimus est, extra resudaret. Inter hos ventriculos septum adest, per quod fere omnes existimant sanguini à dextro ad sinistram aditum patefieri; id ut fiat facilius, in transitu ob vitalium spirituum generationem tenuem reddi: sed longà errant vià: nam sanguis per arteriosam venam ad pulmonem fertur, ibique attenuatur; deinde cum aëre unà per arteriam venalem ad sinistram cordis ventriculum defertur; quod nemo hactenus aut animadvertit, aut scriptum reliquit. Reald. Columb. Anat. lib. vii. p. 325. Edit. Lat.

(f) *Ideirco quando dilatatur, sanguinem à cavâ venâ in dextrum ventriculum suscipit, nec non ab arteriâ venosâ sanguinem paratum ut diximus unà cum aëre in sinistram: propterea membrana illa demittuntur & ingressui cedunt: nam cum cor coarctatur, hæc clauduntur; ne quod suscipitur per easdem vias retrocedat; eodémque tempore membrana tum magnæ arteriæ, tum venæ arteriosa recluduntur, aditumque præbent spirituosus sanguini exeunti, qui per universum corpus funditur, sanguinèque naturali ad pulmones delato. Res itaque semper habet, cum dilatatur, quas prius memoravimus, recluduntur, clauduntur reliquæ, itaque temperies sanguinem qui in dextrum ventriculum ingressus est, non posse in cavam venam retrocedere. Ibid. pag. 330. Vide quoque lib. xi. pag. 411.*

in the *Vena Cava*, which carries it into the Heart, whence it cannot return the same Way that it went; from the Right Ventricle it is thrown into the Lungs by the Pulmonary Artery, where the Valves are so placed, as to hinder its Return that Way into the Heart, and so it is thrown into the Left Ventricle, and by the *Aorta* again, when enliven'd by the Air, diffused thorough the whole Body.

Some Years after appeared *Andreas Cæsalpinus*, who printed his *Peripatetical Questions* at Venice, in Quarto, in MDLXXI. And afterwards, with his *Medical Questions*, at the same Place, in MDXCIII. He is rather more particular than *Columbus*, especially in examining how Arteries and Veins join at their Extremities; which he supposes to be by opening their Mouths into each other. And he uses the word *Circulation* in his *Peripatetical Questions*, which had never been used in that sense before. He also takes notice, that the Blood swells below the Ligature in Veins, and urges that in Confirmation of his Opinion. Some Hints of this Matter are likewise to be found in *Constantinus Varolius*, who printed his *Anatomy* in the Year MDXCIX.

At last, Dr. *William Harvey* printed a Discourse on purpose, upon this Subject,

at

at *Francfort*, in *MDCXXVIII*. This Notion had only been occasionally and slightly treated of by *Columbus* and *Cæsalpinus*, who themselves, in all probability, did not know the Consequence of what they asserted; and therefore it was never applied to other Purposes, either to shew the Uses of the other *Viscera*, or to explain the Natures of Diseases: Neither, for any thing that appears at this day, had they made such numbers of Experiments as were necessary to explain their Doctrine, and to clear it from Opposition. All this *Dr. Harvey* undertook to do, and with indefatigable Pains traced the visible Veins and Arteries throughout the Body, in their whole Journey *from* and *to* the Heart, so as to demonstrate, even to the most incredulous, not only that the Blood circulates thorough the Lungs and Heart, but the very Manner how, and the Time in which that great Work is performed. When he had once proved that the Motion of the Blood was so rapid as we now find it is, then he drew such Consequences from it, as shewed that he thoroughly understood his Argument, and would leave little, at least as little as he could, to future Industry to discover in that particular Part of Anatomy. This gave him a just Title to the Honour of so Noble a Discovery,

covery, since what his Predecessors had said before him, was not enough understood, to form just Notions from their Words. One may also observe how gradually this Discovery, as all abstruse Truths of Humane Disquisition, was explained to the World. *Hippocrates* first talked of the *Usual Motion of the Blood*. *Plato* said, That the *Heart* was the *Original* of the *Veins*, and of the *Blood*, that was carried about every Member of the Body. *Aristotle* also, somewhere, speaks of a *Recurrent Motion of the Blood*. Still all this was only *Opinion* and *Belief*: It was *Rational*, and became Men of their Genius's; but, not having as yet been made evident by Experiments, it might as easily be denied as affirmed. *Servetus* first saw that the Blood passes thorough the Lungs; *Columbus* went further, and shew'd the Uses of the *Valves*, or *Trap-doors* of the Heart, which let the Blood *in* and *out* of their respective Vessels, but not the self same Road. Thus the Way was just open when Doctor *Harvey* came, who built upon the First Foundations: To make his Work yet the easier, the Valves of the Veins, which were discovered by *F. Paul the Venetian*, had not long before been explained by *Fabricius ab Aqua-Pendente*, whence the Circulation was yet more clearly demonstrated.

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There was one thing still wanting to compleat this Theory, and that was, the Knowledge how the Veins received that Blood which the Arteries discharged; first it was believed that the Mouths of each sort of Vessels joined into one another: That Opinion was soon laid aside, because it was found that the Capillary Vessels were so extremely small, that it was impossible with the naked Eye to trace them. This put them upon imagining that the Blood ouzes out of the Arteries, and is absorbed by the Veins, whose small Orifices receive it, as it lies in the Fibres of the Muscles, or in the Parenchyma's of the Bowels: Which Opinion has been generally received by most Anatomists since Dr. *Harvey's* Time. But Monsieur *Leeuwenhoek* has lately found in several sorts of Fishes (g), which were more manageable by his Glasses than other Animals, that Arteries and Veins are really continued Syphons variously wound about each other towards their Extremities in numberless Mazes, over all the Body: And others have found (h) what he says to be very true, in a Water Newt. So that this Discovery has passed untested. And since it has been constantly found, that Nature follows like Methods in all sorts of Animals, where she uses the

(g) Letter
65, 66.

(h) Philos.
Transact.
numb. 177.

the same sorts of Instruments, it will always be believed, that the Blood circulates in Men, after the same Manner as it does in *Eels, Perches, Pikes, Carps, Bats*, and some other Creatures, in which Monsieur *Leeuwenhoek* tried it. Though the Ways how it may be visible to the Eye, in Humane Bodies, have not, that I know of, been yet discovered. However, this *Visible Circulation of the Blood* in these Creatures, effectually removes Sir *William Temple's* Scruple, who seems unwilling to believe the *Circulation of the Blood*, because he could not see it: His Words

(i) 44, 45. are these; (i) *Nay, it is disputed whether Harvey's Circulation of the Blood be true or no; for though Reason may seem to favour it more than the contrary Opinion, yet Sense can very hardly allow it; and to satisfy Mankind, both these must concurr.* Sense therefore here allows it, and that this Sense might the sooner concurr, Monsieur *Leeuwenhoek* describes the Method how this Experiment may be tried in his *LXVIth* Letter. The Inferences that may be made from this noble Discovery are obvious, and so I shall not stay to mention them.

CHAP.

CHAP. XIX.

Further Reflections upon Ancient and Modern Anatomy.

IF after this long Enquiry into the First Discovery of the *Circulation of the Blood*, it should be found that the *Anatomy* of the Heart was but slightly known to the Ancients, it will not, I suppose, be a Matter of any great Wonder. The First Opinion which we have of the Texture of the Heart, was that of *Hippocrates* (*k*), (*l*) *De Corde*, S. 4. That it is a very strong Muscle. This, though true, was rejected afterwards, for want of knowing its true Use. Its Internal Divisions, its Valves, and larger Visible Fibres, were well known, and distinctly described by the Ancients; only they were mistaken in thinking that there is a Communication between the Ventricles thorough the *Septum*, which is now generally known to be an Error. The Order of the Muscular Fibres of the Heart was not known before Dr. *Lower*, who discovered them to be Spiral like a Snail-Shell, as if several Skains of Threads of differing Lengths had been wound up into a Bottom of such a Shape, hollow,
and

(1) De
Motu Ani-
malium,
Part II.
cap. 5.

and divided within. By all these Discoveries *Alphonfus Borellus* (1) was enabled to give such a Solution of all the Appearances of the Motion of the Heart, and of the Blood in the Arteries, upon Mathematical and Mechanical Principles, as will give a more satisfactory Account of the wonderful Methods of Nature, in dispensing Life and Nourishment to every Part of the Body, than all that had ever been written upon these Subjects before those things were found out.

Below the *Midriff* are several very noble *Viscera*: The *Stomach*, the *Liver*, the *Pancreas* or *Sweet-bread*, the *Spleen*, the *Reins*, the *Intestines*, the *Glands of the Mesentery*, and the *Instruments of Generation of both Sexes*; in the Anatomical Knowledge of all which Parts, the Ancients were exceedingly defective.

(m) *Pharmacent. Rational.*

The *Coats of the Stomach* have been separated, and the several *Fibres* of the middle Coat examined by *Dr. Willis* (m) with more Exactness than formerly; he also has been very nice in tracing the *Blood-Vessels* and *Nerves* that run amongst the *Coats*, has evidently shewn that its Inside is covered with a glandulous Coat, whose *Glands* separate that *Mucilage*; which both preserves the *Fibres* from being injured by the *Aliments* which

which the Stomach receives, and concurs with the Spittle to further the Digestion there performed ; and has given a particular Account of all those several Rows of Fibres which compose the muscular Coat. To which if we add *Steno's* Discovery of the Fibres of the Muscular Coat of the Gullet, that they are Spiral in a double Order, one ascending, the other descending, which run contrary Courses, and mutually cross each other in every Winding ; with Dr. *Cole's* (n) Discovery (n) *Philos. Transact.* n. 125. of the Nature of the Fibres of the Intestines, that they also move spirally, tho' not, perhaps, in a contrary Order, from the beginning of the *Duodenum*, to the end of the straight Gut, the Anatomy of those Parts seems to be almost complete.

The great Use of the *Stomach* and the *Guts*, is to prepare the Chyle, and then to transmit it thorough the Glands of the Mesentery into the Blood. This the Ancients knew very well ; the Manner how it was done they knew not. *Galen* (o) (o) *De Usu Partium*, l. 4. c. 2, 3, 4, 5. held, that the Mesaraic Veins, as also those which go from the Stomach to the Liver, carry the Chyle thither ; which, by the Warmth of the Liver, is put into a Heat, whereby the Fæculencies are separated from the more spirituous Parts, and by

(1) De
Motu Ani-
malium,
Part II.
cap. 5.

and divided within. By all these Discoveries *Alphonfus Borellus* (1) was enabled to give such a Solution of all the Appearances of the Motion of the Heart, and of the Blood in the Arteries, upon Mathematical and Mechanical Principles, as will give a more satisfactory Account of the wonderful Methods of Nature, in dispensing Life and Nourishment to every Part of the Body, than all that had ever been written upon these Subjects before those things were found out.

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(m) Phar-
maceut. Ra-
tional.

The *Coats of the Stomach* have been separated, and the several Fibres of the middle Coat examined by Dr. *Willis* (m) with more Exactness than formerly; he also has been very nice in tracing the Blood-Vessels and Nerves that run amongst the Coats, has evidently shewn that its Inside is covered with a glandulous Coat, whose Glands separate that Mucilage; which both preserves the Fibres from being injured by the Aliments which

which the Stomach receives, and concurs with the Spittle to further the Digestion there performed ; and has given a particular Account of all those several Rows of Fibres which compose the muscular Coat. To which if we add *Steno's* Discovery of the Fibres of the Muscular Coat of the Gullet, that they are Spiral in a double Order, one ascending, the other descending, which run contrary Courses, and mutually cross each other in every Winding ; with *Dr. Cole's* ⁽ⁿ⁾ Discovery ^{(n) Philof. Transact. n. 125.} of the Nature of the Fibres of the Intestines, that they also move spirally, tho' not, perhaps, in a contrary Order, from the beginning of the *Duodenum*, to the end of the straight Gut, the Anatomy of those Parts seems to be almost complete.

The great Use of the *Stomach* and the *Guts*, is to prepare the Chyle, and then to transmit it thorough the Glands of the Mesentery into the Blood. This the Ancients knew very well ; the Manner how it was done they knew not. *Galen* ^(o) ^{(o) De Usu Partium, l. 4. c. 2, 3, 4, 5.} held, that the Mesaraic Veins, as also those which go from the Stomach to the Liver, carry the Chyle thither ; which, by the Warmth of the Liver, is put into a Heat, whereby the Fæculencies are separated from the more spirituous Parts, and by

by their Weight sink to the Bottom. The purer Parts go into the *Vena Cava*; the Dregs, which are of two sorts, *Choler* and *Melancholy*, go into several Receptacles; the *Choler* is lodged in the Gall-Bladder, and *Porus Bilarius*: *Melancholy* is carried off by the Spleen. The Original of all these Notions, was Ignorance of the Anatomy of all these Parts, as also of the constant Motion of the Blood thorough the Lungs and Heart. *Herophilus*, who is commended as the ablest Anatomist of Antiquity, found out (p) that there were Veins dispersed quite through the Mesentery, as far as the small Guts reach, which carried the Chyle from the Intestines into several *Glandulous Bodies*, and there lodged them. These are the *Milky Veins* again discovered by *Asellius* about L Years ago; and those Glands which *Herophilus* spoke of, are probably that great Collection of Glands in the Mesentery, that is commonly called the *Pancreas Asellii*. After *Herophilus*, none of the Ancients had the Luck to trace the Motions of the Chyle any farther, and so these *Milky Veins* were confounded with the *Mesaraics*, and 'twas commonly believed, That because all *Mesaraics* carry the Blood from the Intestines into the Liver, therefore they carried Chyle also,

when

(p) De
U. P. l. 4.
c. 19.

when there was any Chyle to carry; and hence, probably, it was that the Liver was believed to be the common Work-House of the Blood. But when *Acellius* had traced the Chyle as far as the great Gland of the Mesentery, it was soon found not to lie there. And *Pecquet*, about XL Years since, discovered the common Receptacle of the Chyle, whither it is all brought. Thence he also found that it is carried, by particular Vessels, thorough the Thorax, almost as high as the Left Shoulder, and there thrown into the Left Subclavian Vein, and so directly carried to the Heart. It has also been discovered, that in his Canal, usually call'd *Ductus Thoracicus*, there are numerous Valves, which hinder the Return of the Chyle to the common Receptacle, so that it can be moved forwards, but not backwards.

Since this Passage of the Chyle has been discovered, it has been by some believed, that the Milk is conveyed into the Breasts, by little Vessels, from the *Ductus Thoracicus*. The whole Oeconomy of that Affair has been particularly described, very lately, by Mr. *Nack*, before whose time it was but imperfectly known. He says therefore, that the Breasts are Heaps of Glands, supplied with Blood by innumerable Ra-

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mifications

mifications of the Axillary and Thoracic Arteries; some of which passing thorough the Breast-bone, unite with the Vessels of the opposite Side. These Arteries, which are unconceivably small, part with the Milk in those small Glands, into small Pipes, four or five of which meeting together, make one small Trunk; of these small Trunks, the large Pipes, which terminate in the Nipple, are made up; though before they arrive thither, they straiten into so small a compass, that a stiff Hair will just pass thorough. The Nipple, which is a Fibrous Body, has seven or eight, or more Holes, thorough which every Pipe emits its Milk upon Suction; and lest any one of them being stopp'd, the Milk should stagnate, they all have cross Passages into each other at the bottom of the Nipple, where it joins to the Breast.

The fore-mentioned Discovery of the Passage of the Chyle, obliged Men to re-examine the Notions which, till then, had generally obtained, concerning the Nature and Uses of the *Liver*. Hitherto it had been generally believed, that the Blood was made there, and so dispersed into several Parts, for the Uses of the Body, by the *Vena Cava*. *Erasistratus*, indeed, supposed (q) that its principal Use

(q) *Galen*
de U. P.
Liv. c. 13.

was,

was, to separate the Bile, and to lodge it in its proper Vessels: But, for want of farther Light, his Notion could not then be sufficiently proved; and so it presently fell, and was never revived, till *Afellius's* and *Pécquet's* Discoveries put it out of doubt. Till *Malpighius* discovered its

Texture by his Glasses, its Nature was very obscure. But he has found out, (1.) That the Substance of the Liver is framed of innumerable Lobules, which are very often of a Cubical Figure, and consist of several little Glands, like the Stones of Raisins; so that they look like Bunches of Grapes, and are each of them cloathed with a distinct Membrane.

(2.) That the whole Bulk of the Liver consists of these Grape-stone-like Glands, and of divers sorts of Vessels. (3.) That the small Branches of the *Cava*, *Porta*, and *Porus Bilarius*, run thorough all, even the least of these Lobules, in an equal Number; and that the Branches of the *Porta* are as Arteries that convey the Blood to, and the Branches of the *Cava* are the Veins which carry the Blood from all these little Grape-stone-like Glands. From whence it is plain, that the Liver is a Glandulous Body, with its proper Excretory Vessels, which carry away the Gall that lay before in the Mass of the Blood.

(r) De
U. P. l.v.
c. 2.

Near the Liver lies the *Pancreas*, which *Galen* believed (r) to be a Pillow to support the Divisions of the Veins, as they go out of the Liver; and, for what appears at present, the Ancients do not seem to have concerned themselves any further about it. Since, it has been found to be a Glandulous Body, wherein a distinct Juice is separated from the Blood; which, by a peculiar Canal, first discovered by *Georgius Wirsungus*, a *Paduan* Physician, is carried into the *Duodenum*; where meeting with the Bile, and the Aliment just thrown out of the Stomach, assists and promotes the Business of Digestion.

The *Spleen* was as little understood as the *Pancreas*, and for the same Reasons: Its Anatomy was unknown, and its Bulk made it very remarkable; something therefore was to be said about it: And what no Body could positively disprove, might the easier be either received or contradicted. The most general Opinion was, that the grosser Excrements of the Chyle and Blood were carried off from the Liver, by the *Ramus Splenicus*, and lodged in the Spleen, as in a common Cistern: But since the *Circulation of the Blood* has been known, it has been found, that the Blood can go from the Spleen to the Liver, but that nothing can return back

back again into the Spleen. And as for its Texture, (s) *Malpighius* has discover'd, (s) *De Liene.* that the Substance of the Spleen, deducting the numerous Blood-Vessels and Nerves, as also the Fibres which arise from its Second Membrane, and which support the other Parts, is made up of innumerable little Cells, like Honey-combs, in which there are vast Numbers of small Glandules, which resemble Bunches of Grapes; and that these hang upon the Fibres, and are fed by Twigs of Arteries and Nerves, and send forth the Blood there purged, into the *Ramus Splenicus*, which carries it into the Liver; to what Purpose, not yet certainly discovered.

The Use of the *Reins* is so very conspicuous, that, from *Hippocrates's* Time, downwards, no Man ever mistook it: But the Mechanism of those wonderful Strainers was wholly unknown, till the so often mentioned *Malpighius* (s) found it (t) *De Renibus.* out. He therefore, by his Glasses, discovered, that the Kidneys are not one uniform Substance, but consist of several small Globules, which are all like so many several Kidneys, bound about with one common Membrane; and that every Globule has small Twigs from the emulgent Arteries, that carry Blood to it; Glands, in which the Urine is strained from it;

Veins, by which the purified Blood is carried off to the Emulgent Veins, thence to go into the *Cava*; a Pipe, to convey the Urine into the great Basin in the middle of the Kidney; and a Nipple, towards which several of those small Pipes tend, and thorough which the Urine ouzes out of them into the Basin. This clear Account of the Structure of the Reins, has effectually confuted several Notions that Men had entertained, of some Secondary Uses of those Parts; since hereby it appears, that every Part of the Kidneys is immediately and wholly subservient to that single Work, of freeing the Blood from its superfluous *Serum*.

What has been done by Modern Anatomists, towards the Compleating of the Knowledge of the remaining Parts, I shall omit. That the Ancients likewise took Pains about them, is evident from the Writings of *Hippocrates*, *Aristotle* and *Galen*. The Discoveries which have since been made are so great, that they are, in a manner, undisputed: And the Books which treat of them are so well known, that it will not be suspected that I decline to enlarge upon them, out of a Dread of giving up more to the Ancients in this Particular, than I have done all along.

The Discoveries hitherto mention'd, have been of those Parts or Humours of the Body, whose Existence was well enough known to the Ancients. But, besides them, other Humours, with Vessels to separate, contain, and carry them to several Parts of the Body, have been taken notice of; of which, in strictness, the Ancients cannot be said to have had any sort of Knowledge. These are, the *Lympha*, or Colourless Juice, which is carried to the Chyle and Blood, from separate Parts of the Body: And the *Mucilage of the Joints*, which lubricates them, and the *Muscles*, in their Motions. The Discovery of the *Lympha*, which was made about *XL* Years ago, is contended for by several Persons. *Thomas Bartholine*, a *Dane*, and *Olaus Rudbeck*, a *Suede*, published their Observations about the same time: And Dr. *Joliffe*, an *English-Man*, shewed the same to several of his Friends, but without publishing any thing concerning them. The Discoveries being undoubted, and all Three working upon the same Materials, there seems no reason to deny any of them the Glory of their Inventions. The Thing which they found, was, that there are innumerable small, clear Vessels in many Parts of the Body, chiefly in the Lower Belly, which convey

a Colourless Juice, either into the common Receptacle of the Chyle, or else into the Veins, there to mix with the Blood. The *Valves* which *Frederic Ruysch* found and demonstrated in them, about the same Time, manifestly shewed, that this is its Road; because they prove, that the *Lympha* can go forwards from the Livery Spleen, Lungs, Glands of the Loins and Neck, or any other Place, whence they arise, towards some Chyliferous Duct, or Vein; but cannot go back from those Chyliferous Ducts, or Veins, to the Place of their Origination. What this Origination is, was long uncertain, it not being easy to trace the several Canals up to their several Sources. *Steno* (u) and *Malpighius* (w) did, with infinite Labour, find, that abundance of Lympheducts passed thorough those numerous Conglobate Glands that are dispersed in the Abdomen and Thorax; which made them think that the Arterious Blood was there purged of its *Lympha*, that was from thence carried off into its proper Place, by a Vessel of its own. But Mr. *Nuck* has since (x) found, that the Lympheducts arise immediately from Arteries themselves; and that many of them are percolated thorough those Conglobate Glands, in their Way to the Receptacle

(u) Observat. Anatom.

(w) Epist. de Glandul. Conglobat.

(x) Adenograph.

ceptacle of the Chyle, or those Veins which receive them. By these, and innumerable other Observations, the Uses of the Glands of the Body have been found out; all agreeing in this one thing, namely, That they separate the several Juices that are discernible in the Body, from the Mass of the Blood wherein they lay before. From their Texture they have of late been divided into *Conglomerate* and *Conglobate*. The *Conglomerate* Glands consist of many smaller Glands, which lie near one another, covered with one common Membrane, with one or more common Canals, into which the separated Juice is poured by little Pipes, coming from every smaller Glandule; as in the Liver, the Kidneys, the Pancreas, and Salival Glands of the Mouth. The *Conglobate* Glands are single, often without an Excretory Duct of their own, only perforated by the Lympheducts. Of all which Things, as Essential to the Nature of Glands, the Ancient Anatomists had no sort of Notion.

The *Mucilage of the Joints and Muscles* was found out by Dr. *Havers* (y). He discovered in every Joint, particular Glands, out of which issues a Mucilaginous Substance, whose Nature he examined by numerous Experiments; which, with

(y) *Osteolog.*

with the Marrow supplied by the Bones, always serves to oil the Wheels, that so our Joints and Muscles might answer those Ends of Motion, for which Nature designed them. This was a very useful Discovery, since it makes abundance of Things that were obscure in that part of Anatomy, plain, and facile to be understood: And, among other Things, it shews the Use of that excellent Oil which is contained in our Bones, and there separated by proper Strainers, from the Mass of the Blood; especially, since, by a nice Examination of the true inward Texture of all the Bones and Cartilages of the Body, he shew'd how this Oil is communicated to the Mucilage, and so united, as to perform their Office. And if one compares what Dr. *Havers* says of Bones and Cartilages, with what had been said concerning them before him, his Observations about their Frame may well be added to some of the noblest of all the former Discoveries.

These are some of the most remarkable Instances, how far the Knowledge of the Frame of our Bodies has been carried in our Age. Several Observations may be made concerning them, which will be of Use to the present Question. (I.) It is evident, that only the most visible Things were

were anciently known ; such alone as might be discovered without great Nicety. Muscles and Bones are easily separable ; their Length is soon traced, and their Origination presently found. The same may be truly said of large Blood-Vessels, and Nerves : But when they come to be exquisitely sub-divided, when their Smallness will not suffer the Eye, much less the Hand, to follow them, then the Ancients were constantly at a Loss : For which Reason, they understood none of the *Viscera*, to any tolerable degree. (2.) One may perceive, that every new Discovery strengthens what went before ; otherwise the World would soon have heard of it, and the erroneous Theories of such Pretenders to new Things would have been exploded and forgotten, unless by here and there a curious Man, that pleases himself with reading obsolete Books. *Nullius in Verba* is not only the Motto of the *ROYAL SOCIETY*, but a received Principle among all the Philosophers of the present Age : And therefore, when once any new Discoveries have been examined, and received, we have more Reason to acquiesce in them, than there was formerly. This is evident in the *Circulation of the Blood* : Several Veins and Arteries have been found, at least,
more

more exactly traced, since, than they were in Dr. *Harvey's* Time. Not one of these Discoveries has ever shewn a single Instance of any Artery going to, or of any Vein coming from the Heart. Ligatures have been made of infinite Numbers of Vessels; and the Course of all the Animal Juices, in all manner of living Creatures, has thereby been made visible to the naked Eye; and yet not one of these has ever weakened Dr. *Harvey's* Doctrine. The Pleasure of Destroying in Matters of this kind, is not much less than the Pleasure of Building. And therefore, when we see that those Books which have been written against some of the eminentest of these Discoveries, though but a few Years ago, comparatively speaking, are so far dead, that it is already become a Piece of Learning even to know their Titles, we have sufficient Assurance that those Discoverers, whose Writings out-live Opposition, neither deceive themselves nor others. So that, whatsoever it might be formerly, yet in this Age, general Consent in Physiological Matters, especially after a long Canvass of the Things consented to, is an almost infallible Sign of Truth. (3.) The more Ways are made use of to arrive at any one particular Part of Knowledge, the surer

furor that Knowledge is, when it appears that these different Methods lend Help each to other. If *Malpighius's*, or *Leeuwenhoek's* Glasses had made such Discoveries as Men's Reason could not have agreed to; if objects had appeared confused and disorderly in their Microscopes; if their Observations had contradicted what the naked Eye reveals, then their Verdict had been little worth. But when the Discoveries made by the Knife and the Microscope, disagree only as Twi-light and Noon-day, then a Man is satisfied that the Knowledge which each affords to us, differs only in Degree, not in Sort. (4.) It can signifie nothing in the present Controversie, to pretend that Books are lost; or to say, that, for ought we know, *Herophilus* might anciently have made this Discovery, or *Erasistratus* that; their Reasonings demonstrate the Extent of their Knowledge, as convincingly as if we had a Thousand old Systems of Ancient Anatomy extant. (5.) In judging of Modern Discoveries, one is nicely to distinguish between *Hypothesis* and *Theory*. The Anatomy of the Nerves holds good, whether the Nerves carry a Nutritious Juice to the several Parts of the Body, or no. The *Pancreas* sends a Juice into the *Duodenum*, which mixes there with the Bile,

Bile, let the Nature of that Juice be what it will. Yet here a nice Judge may observe, that every Discovery has mended the Hypotheses of the Modern Anatomists; and so it will always do, till the Theories of every Part, and every Juice, be as entire as Experiments and Observations can make them.

As these Discoveries have made the Frame of our own Bodies a much more intelligible Thing than it was before, though there is yet a great deal unknown; so the same Discoveries having been applied to, and found in almost all sorts of known Animals, have made the Anatomy of Brutes, Birds, Fishes and Insects, much more perfect than it could possibly be in former Ages. Most of the Rules which *Galen* lays down in his *Anatomical Administrations*, are, concerning the Dissection of Apes. If he had been now to write, besides those tedious Advices how to part the Muscles from the Membranes, and to observe their several Insertions and Originations, the Jointings of the Bones, and the like, he would have taught the World how to make Ligatures of all sorts of Vessels, in their proper Places; what Liquors had been most convenient to make Injections with, thereby to discern the Courses of Veins, Arteries, Chyle-Vessels,

fels, or Lympheducts ; how to unravel the Testicles ; how to use Microscopes to the best Advantage : He would have taught his Disciples when and where to look for such and such Vessels or Glands ; where Chymical Trials were useful ; and what the Processes were, by which he made his Experiments, or found out his Theories : Which Things fill up every Page in the Writings of later Dissectors. This he would have done, as well as what he did, had these Ways of making Anatomical Discoveries been then known and practised. The World might then have expected such Anatomies of Brutes, as Dr. *Tyson* has given of the *Rattle-Snake* ; or Dr. *Moulin*, of the *Elephant* : Such Dissections of Fishes as Dr. *Tyson's* of the *Porpess* ; and *Steno's*, of a *Shark's Head* : Such of Insects as *Malpighius's* of a *Silk-Worm* ; *Swammerdam's*, of the *Ephemeron* ; Dr. *Lister's*, of *Snails*, and *Testaceous Animals* ; Mr. *Waller's*, of the *Flying Gloeworm* ; and the same Dr. *Tyson's*, of *Long and Round Body-Worms*. All which shew Skill and Industry, not conceivable by a Man that is not a little versed in these Matters.

To this *Anatomy of Bodies that have Sensitive Life*, we ought to add the *Anatomy of Vegetables*, begun and brought to

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to

to great Perfection in *Italy* and *England* at the same Time, by *Malpighius* and *Dr. Grew*. By their Glasses they have been able to give an Account of the different Textures of all the Parts of Trees, Shrubs and Herbs; to trace the several Vessels which carry Air, Lympha, Milk, Rosin and Turpentine, in those Plants which afford them; to describe the whole Process of Vegetation, from Seed to Seed; and, in a word, though they have left a great deal to be admired, because it was to them incomprehensible; yet they have discovered a great deal to be admired, because of its being known by their Means.

CHAP. XX.

Of Ancient and Modern Natural Histories of Elementary Bodies and Minerals.

HAVING now finished my Comparison of *Ancient and Modern Anatomy*, with as much Exactness as my little Insight into those Things would give me leave, I am sensible that most Men will think that I have been too tedious. But, besides

besides that I had not any where found it carefully done to my Hands, (though it is probable that it has in Books which have escaped my Notice,) I thought that it would be a very effectual Instance, how little the Ancients may have been presumed to have perfected any one Part of Natural Knowledge, when their own Bodies, which they carried about with them, and which, of any thing, they were the nearest concerned to know, were, comparatively speaking, so very imperfectly traced. However, in the remaining Parts of my Parallel, I shall be much shorter; which, I hope, may be some Amends for my too great Length in this.

From those Instruments, or Mechanical Arts, whether Ancient or Modern, by which Knowledge has been advanced, I am now to go to the Knowledge it self. According to the Method already proposed, I am to begin with *Natural History* in its usual Acceptation, as it takes in the Knowledge of the several Kinds of Elementary Bodies, Minerals, Plants, Insects, Beasts, Birds and Fishes. The Usefulness and the Pleasure of this Part of Learning, is too well known to need any Proof. And besides, it is a Study, about which the greatest Men of all Ages have

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employed themselves. Of the very few lost Books that are mentioned in the *Old Testament*, one was an *History of Plants*, written by the Wife of Men, and he a King. So that there is Reason to believe, that *Natural History* was cultivated with abundance of Care by all those who did not place the Perfection of Knowledge in the Art of Wrangling about Questions, which were either useless, or which could not easily be decided.

Before I enter into Particulars, it is necessary to enquire what are the greatest Excellencies of a Compleat History of any one sort of Natural Bodies. This may soon be determined. That History of any Body, is certainly the best, which, by a full and clear Description, lays down all the Characteristical Marks of the Body then to be described; so as that its Specific Idea may be clearly form'd, and it self certainly and easily distinguish'd from any other Body, though, at first View, it be never so like it; which enumerates all its known Qualities; which shews whether there are any more besides those commonly observed; and, last of all, which enquires into the several Ways whereby that Body may be beneficial or hurtful to Man, or any other Body; by giving a particular Account of the several

Phænomena

Phænomena which appear upon its Application to, or Combination with other Bodies, of like, or unlike Natures. All this is plainly necessary, if a Man would write a full History of any single Species of Animals, Plants, Insects, or Minerals, whatsoever. Or, if he would draw up a General History of any one of these *Universal Sorts*, then he ought to examine wherein every Species of this *Universal Sort* agrees each with other; or wherein they are discriminated from any other *Universal Sort* of Things: And thus, by degrees, descend to Particulars, and range every Species, not manifestly Anomalous, under its own Family, or Tribe; thereby to help the Memory of Learners, and assist the Contemplations of those who, with Satisfaction to themselves and others, would Philosophize upon this amazing Variety of Things.

By this Test the Comparison may be made. I shall begin with the simplest Bodies first; which, as they are the commonest, so, one would think, should have been long ago examined with the strictest Care. By these I mean, *Air, Water, Fire, Earth*, commonly called *Elements*. Three of these are certainly distinct and real Bodies, endued with proper and peculiar Qualities, and so come under the present Question.

Of the *History of Air* the Ancients seemed to know little more than just what might be collected from the Observation of its most obvious Qualities. Its Necessity for the immediate Subsistence of the Life of all sorts of Animate Bodies, and the unspeakable Force of Rapid Winds, or Air forcibly driven all one Way, made it be sufficiently observed by all the World; whilst its Internal Texture, and very few of its remoter Qualities, were scarce so much as dreamt of by all the Philosophers of Antiquity. Its Weight only was known to Aristotle (2), (or the Author of the Book *de Caelo*.) who observed, that a full Bladder out-weighed an empty one. Yet this was carried no further by any of the Ancients, that we know of; dis-believed by his own School, who seemed not to have attended to his Words, opposed and ridiculed when again revived, and demonstrably proved, by the Philosophers of the present Age. All which are Evidences, that anciently it was little examined into, since Proofs were wanting to evince that, which Ignorance only made disputable. But this has been spoken to already; I shall therefore only add, that, besides what Mr. Boyle has written concerning the Air, we may consult Otto Guericke's *Magdebourg Experiments*; the *Experiments of the*

(2) De
Caelo, l. 4.
c. 4.

Academy

Academy del Gimetta; Sturmius's Collegium Curiosum; Mr. Halley's Discourses concerning Gravity, and the Phenomena of the Baroscope, in the Philosophical Transactions (a). From all which, we shall find, not only how little of the Nature of the Air was anciently known; but also, that there is scarce any one Body, whose Theory is now so near being compleated, as is that of the Air.

(a) Num.
179, &
181.

The *Natural History of Earth and Water* comes under that of *Minerals*: *Fire*, as it appears to our Senses, seems to be a Quality, rather than a Substance; and to consist in its own Nature, in a Rapid Agitation of Bodies, put into a quick Motion; and divided by this Motion, into very small Parts. After this had been once asserted by the *Corpuscularian* Philosophers, it was exceedingly strengthened by many Experimental Writers, who have taken abundance of Pains to state the whole *Doctrine of Qualities* clearly, and intelligibly; that so Men might know the difference between the Existence or Essential Nature of a Body, and its being represented to our Senses under such or such an Idea. This is the Natural Consequence of proceeding upon clear and intelligible Principles; and resolving to admit nothing as conclusive, which cannot be ma-

Of the *History of Air* the Ancients seemed to know little more than just what might be collected from the Observation of its most obvious Qualities. Its Necessity for the immediate Subsistence of the Life of all sorts of Animate Bodies, and the unspeakable Force of Rapid Winds, or Air forcibly driven all one Way, made it be sufficiently observed by all the World; whilst its Internal Texture, and very few of its remoter Qualities, were scarce so much as dreamt of by all the Philosophers of Antiquity. Its Weight only was known to Aristotle (2), (or the Author of the Book *de Caelo*,) who observed, that a full Bladder out-weighed an empty one. Yet this was carried no further by any of the Ancients, that we know of; dis-believed by his own School, who seemed not to have attended to his Words, opposed and ridiculed when again revived, and demonstrably proved, by the Philosophers of the present Age. All which are Evidences, that anciently it was little examined into, since Proofs were wanting to evince that, which Ignorance only made disputable. But this has been spoken to already; I shall therefore only add, that, besides what Mr. Boyle has written concerning the Air, we may consult Otto Guericke's *Magdebourg-Experiments*; the *Experiments of the Academy*

(2) De
Caelo, l. 4.
c. 4.

Academy del Cimento; Sturmius's Collegium Curiosum; Mr. Halley's Discourses concerning Gravity, and the Phenomena of the Baroscope, in the Philosophical Transactions (a).

(a) Num.
179, &
181.

From all which, we shall find, not only how little of the Nature of the Air was anciently known; but also, that there is scarce any one Body, whose Theory is now so near being compleated, as is that of the Air.

The Natural History of Earth and Water comes under that of Minerals: Fire, as it appears to our Senses, seems to be a Quality, rather than a Substance; and to consist in its own Nature, in a Rapid Agitation of Bodies, put into a quick Motion; and divided by this Motion, into very small Parts. After this had been once asserted by the Corpuscularian Philosophers, it was exceedingly strengthened by many Experimental Writers, who have taken abundance of Pains to state the whole Doctrine of Qualities clearly, and intelligibly; that so Men might know the difference between the Existence or Essential Nature of a Body, and its being represented to our Senses under such or such an Idea. This is the Natural Consequence of proceeding upon clear and intelligible Principles; and resolving to admit nothing as conclusive, which cannot be manifestly

nifestly conceived, and evidently distinguished from every thing else. Here, if in any thing, the old Philosophers were egregiously defective. What has been done since, will appear, by consulting, among others, the Discourses which Mr. Boyle has written upon most of the considerable Qualities of Bodies, which come under our Notice; such as his *Histories of Fluidity and Firmness, of Colours, of Cold, his Origin of Forms and Qualities, Experiments about the Mechanical Production of divers particular Qualities*, and several others, which come under this Head; because they are not Notions framed only in a Closet, by the help of a lively Fancy; but genuine Histories of the *Phænomena* of Natural Bodies; which appeared in vast Numbers, after such Trials were made upon them, as were proper to discover their several Natures.

And therefore, that it may not be thought that I mistake every plausible Notion of a Witty Philosopher, for a new Discovery of Nature, I must desire that my former Distinction between *Hypotheses* and *Theories* may be remembred. I do not here reckon the several *Hypotheses* of Des Cartes, Gassendi, or Hobbes, as Acquisitions to real Knowledge; since they may only be Chimæra's, and amusing Notions,

Notions, fit to entertain working Heads. I only alledge such Doctrines as are raised upon faithful Experiments, and nice Observations; and such Consequences as are the immediate Results of, and manifest Corollaries drawn from, these Experiments and Observations. Which is what is commonly meant by *Theories*. But of this more hereafter.

That the *Natural History of Minerals* was anciently very imperfect, is evident from what has been said of *Chymistry* already; to which, all the Advances that have ever been made in that Art, unless when Experiments have been tried upon *Vegetable* or *Animal Substances*, are properly to be referred. I take *Minerals* here in the largest sense; for all sorts of *Earths*, *Sulphurs*, *Salts*, *Stones*, *Metals*, and *Minerals* properly so called. For *Chymistry* is not only circumstantially useful, but essentially necessary here; since a great many Minerals of very differing Natures would never have been known to have belonged to several Families, if they had not been examined in the Furnaces of the Chymists. Nay, most *Fossils* are of such a Nature, that what sort of Minerals they contain, cannot be known, till they be tried in the Fire. Worthless *Marcasites* cannot any otherwise be distinguisht from

rich Lumps of Ore. For this Reason, and because the Subterraneous World is not so easily accessible, the Knowledge of Fossils, taken in the general, has received less Advancement than any one Part of Natural Learning. But I shall rather chuse to speak here of the Discoveries which have been made in the Mineral Kingdom without the help of Chymistry: The greatest of which is, of a Stone which the

(b) Their Opinions are collected by *Gassendi*, in his *Animadversiones* upon *Laërtius's Life of Epicurus*, p. 362, 363.

the Ancients admired, without ever examining what Uses it might be applied; and that is the *Magnet*, the noblest Properties whereof

Sir William Temple acknowledges to be anciently unknown (c) Which is more, indeed, than what some do

(d) This they have collected from a Passage in *Plautus*, *Merc. Act. 4. Sc. 2. Huc Secundus Venit nunc est, cape modo vorforiam*; where by *vorforia* they understand the *Compass*, because the Needle always points towards the North: Whereas *vorforia* is nothing but that Rope with which the Mariners turned their Sails.

(e) *William Temple*. However, I shall mention some of the greatest; because it charges the Moderns with not making all those

those Uses of so noble an Invention, which he supposes the Ancient Greeks and Romans would have made, had it fallen into their Hands: Which makes him assert, that the Discoveries hereby made in remote Countries have been rather pursued to accumulate Wealth (e), than to encrease Knowledge. Now, if both these can be done at once, there is no harm done: And since there is no Dispute of the one, I think it will be an easie Matter to prove the other: I shall name but a few Particulars, most of them rather belonging to another Head.

(e) P. 49.

Geography therefore was anciently a very imperfect Study, for want of this Knowledge of the Properties of the Loadstone. The Figure of the Earth could formerly only be guess'd at; which Sir William Temple's admired Epicurus (f) did, for that Reason, deny to be Round; wherein he seems to have been more reasonable, than in many other of his Assertions; because he thought it an Affront to the Understanding of Man, to be determined by bare Conjectures, in a Matter which could at that time be no other Way decided. Whereas now, most Parts of the Ocean being made easily accessible, the Latitudes, and respective Bearings of every Place, are commonly known: The Nature and Appearances

(f) Vid. Gassendi's Animadversions upon Laertius's Epicurus, pag. 672.

pearances of Winds and Tides are become familiar, and have been nicely examined by Intelligent Men in all Parts of the World: The Influence of the Moon, joined with the Motion of the Earth, have been taken in upon almost infallible Grounds, to found Theories of the Sea's Motion upon. And there are great Numbers of other noble, pleasant and useful Propositions in *Geography*, *Astronomy* and *Navigation*, which ultimately owe their Original to the Discovery of that single Quality of this wonderful Stone, *that it always points towards the North*. If these Sciences have brought to us the Wealth of the *Indies*; if they have enlarged the Commerce and Intercourse of Mankind, it is so far from being a Disparagement to the Industry of the Moderns, who have cultivated them to such useful Purposes, that it is the highest Character that could be given of those Men, that they pursued their Inventions to such noble Ends. Knowledge, not reduced to Practice, when that is possible, is so far imperfect, that it loses its principal Use. And it is not for acquiring Wealth, but for misemploying it when it is acquired, that a Man ought to be blamed.

Now, to compleat what I have to say of *Geography* all at once, I shall take notice,

rice, that as the Improvements by Navigation have made all the Sea-Coasts of the Universe accessible, so the Art of Engraving upon Copper-Plates has made it easie for Men to draw such Draughts of every particular Coast, as will imprint lasting and just Idea's of all the Parts of the known World. For want of this, the Ancient Descriptions even of those Countries which they knew, were rude, and imperfect: Their Maps were neither exact, nor beautiful: The Longitudes and Latitudes of Places, were very little considered; the latter of which can now be exactly determined, and the former may be very nearly adjusted, since the Application of Telescopes to Astronomical Uses has enabled Men to make much nicer Observations of the Moon's Eclipses than could formerly be made; besides those of *Jupiter's* Satellites, to which the Ancients were entirely Strangers. This makes our Maps wonderfully exact; which are not only the Divertisements of the Curious, but of unspeakable Use in Civil Life, at Sea especially; where, by the help of Sea-Charts, Sailers know where they are, what Rocks lie near them, what Sands they must avoid; and can as perfectly tell which Way they must steer to any known Port of the Universe, as a Traveller

veller can, upon *Salisbury Plain*, or *New Market-Heath*, which Way he must ride to a great Town, which he knows beforehand is not far from the Edge of the Plain, or of the Heath. *Vellerus* has printed some ancient Maps (g), that were made for the Direction of the *Roman Quarter-Masters*: and if a Man will compare them with *Sausan's*, or *Blaeu's*, he will see the difference: which in future Ages will certainly be vastly greater, if those Countries which are now barbarous, or undiscovered, should ever come into the Hands of a Civilized or Learned People. But I have not yet done with the *Lodestone*.

Besides these occasional Uses of the *Magnet*, its Nature, abstractedly taken, has been nicely enquired into, thereby to discover both its own Qualities, and its Relation to other Bodies that are round about it. And here, indeed, one may justly wonder, that when *Flavio Amalphius* (h) had discovered, that Iron touch'd with a *Magnet*, always points towards the

(g) Commonly called the *Pentingerian Tables*.

(h) To him this Discovery is attributed

by *Salmuth* upon *Pancirollus*; others call him *John Goin*, or *Amalphius*; but *Gassendi*, *Animad.* pag. 264. says, it was found out by a Frenchman, about the Year MCC. since it is mentioned by one *Gavotus Prævinus*, a French Poet of that Time, who calls the *Compass Meriveta*; to which *Gassendi* also adds, That it was most probably a French Invention, because the North-Point is by all Nations marked in their Compasses by a *Flower-de-Luce*, the Arms of France.

North.

North, that all the Philosophers of that Age did not immediately try all manner of Experiments upon that strange Stone, which was found to be so exceedingly useful in Matters of common Life. The Portuguese, who first made daring Voyages, by the Help of the Compass, into the Southern and South-Eastern Seas, better knew the Value of that rich Discovery: But Philosophy was in those darker Ages divided between the School-men and the Chymists; the former presently salved the Business with their *Substantial Forms*, and what they could not comprehend, came very properly under the Notion of an *Occult Quality*. The latter found nothing extraordinary in their Crucibles, when they analyzed the *Magnet*; and so they seem soon to have given it over: Besides, in those Days, few Men studied Chymistry with any other Design than that of finding out the Philosopher's Stone, to which the Load-stone could do them no further service than that of supplying them with another hard Name to Cant with (i). For these Reasons therefore, it lay in a good measure neglected by Men of Letters, till our Famous Country-man, Doctor Gilbert of Colchester, by a vast number of Experiments, found that the *Earth* was but a *larger Magnet*; and he, indeed, was

(i) *Magnesia Nigra*, is one of the hard Words used by Erycneus Philalethes: and it is ridiculed by Surly, in Ben Jonson's Alchemist.

the first Author of all those *Magnetical Speculations* which have been made since his had the good fortune to be generally approved. This Great Man, whom *Galileo* and *Kepler* express a great Veneration for in their Writings, deserves here to be mentioned upon another Account ; because He, my Lord *Bacon*, and Mr. *Harriot*, all *Englishmen*, are the Three Men to whom *Monsieur Des Cartes* was so very much obliged for the first Hints of the greatest Things, which he has given us in his *Philosophical and Mathematical Discourses*. For nothing does more convincingly put Things of this Nature out of doubt, than to trace them up to their first Originals, which can be done but in very few. So great have been the Advantages which have accrued to the World, only by Men's Enquiries into the Properties of one single Natural Body.

But the Knowledge of *Minerals* (strictly so called) though infinitely useful to the Life of Man, is not the only thing which may be learn'd in the Subterraneous World. The Bowels of the Earth are wonderfully Fruitful, and afford a Variety, comparatively speaking, not much regarded till these later Ages. Not only *Salts* and *Metals*, *Marble*, *Coal*, and *Amber*, may be, and are dug from thence ; but the

the Inhabitants of the Earth and Sea, have made their Graves in the solidest Rocks, in the profoundest Caverns, in Places, to one's thinking, the most inaccessible, as well as the most unexpected, that could have been imagined. Beds of *Oysters*, *Cockles*; and *Scallops*, have been found in the Bowels of the highest Hills, and the hardest Quarries. Groves of Trees have been taken out of the Ground, in Countries where they have never been seen to grow. In short, by raking into the deepest Places of the Earth, we have seen that Things have once changed their Places; and without the Authority of Writings, or Ancient Tradition, we are assured that the Face of the World is not what it always was.

Men have yet proceeded further, and made Observations upon the Figures of every Stone which they found; very many of which, Antiquity, and even every other Age but this, did quite overlook. Those, whose Lustre and Colour made them remarkable, which are peculiarly called *Gems*, or those whose Figure had something that was surprizing at first view, were indeed taken notice of, and sufficiently valued; but of them too, very few were then known, in comparison of what have since been discovered. The
Ancients

Ancients Knowledge of the Species of Stones, and of the whole Natural History of the Earth, is in a manner all contained in the 33^d, 34th, 35th, 36th, & 37th Books of Pliny's Natural History; where there is so much Fabulous, that it is not easily distinguishable from what is Real: If this

(k) De Purpura: Dissertat. de Glossopetris.

(l) La Vana Speculazione disingannata dal Senso, printed at Naples, in MDCLXX. and epitomiz'd in the Philosoph. Transact. numb. 219.

(m) In Prodromo: & Dissertat. de Cane Carcharia & Glossopetris.

(n) Travels, p. 113, 131. and Three Physico-Theological Discourses, Edit. 2.

(o) Microgr. p. 109, 112. Lecture of Springs, p. 48, 49, 50.

(p) Philosoph. Transact. & de Cochliis.

(q) Essay towards a Natural History of the Earth.

(r) Nat. Hist. of Oxfordshire.

Were compared with the Writings of Fabius Calymna (k), Agostino Scilla (l), Steno (m), Ray (n), Hooke (o), Lister (p), Woodward (q), and Plot (r), what new Scenes of Knowledge would appear? What Discoveries has Signior Scilla, made of the Petrifications (as they are vulgarly esteemed) of the Isle of Malta alone? The Ancients were not sufficiently aware of the Treasures which the Earth contains within it. The Ancients, did I say? hardly any of the Moderns, till within these last Thirty Years. Gold, indeed, and Silver, have, for very many Ages, been insatiably thirsted after; and the other Metals, Tin and Copper, Iron and Lead, whose Uses have long been known, have been carefully searched for. But when those

those Six Metals, and some of the most remarkable Minerals, such as *Mercury, Antimony, Vitriol, Nitre, Sulphur, Sal Gemmae, Pit-Coal, Amber,* and the like, were once found, the Curiosity of Mankind was pretty much at a stand. Whereas, since so many Learned and Industrious Men have thought it worth their while to make Enquiries after the nicest Varieties, and most minute Productions of their Mother Earth, they have found such incredible Numbers of *formed Stones,* and *Shells as hard as Stones,* upon its Surface, and in its lowermost Recesses that Men have ever dug to, that they have thereby been enabled to raise several Hypotheses (s), which may perhaps hereafter, when Men are better acquainted with the Productions of the Subterraneous World, be a means of solving some of the greatest Difficulties in the *Mosaical History.*

I have taken notice of this, to justify those Gentlemen who have laboured in these sort of Enquiries: Some of them who have taken the greatest Pains, have been publickly ridiculed (t), as if what they had done, had tended no more to the Advancement of valuable Knowledge, than if they had gather'd Pebbles upon

(s) Vid. Woodward's *Essay towards the Natural History of the Earth,* and Whiston's *Theory of the Earth.*

(t) See the *Character of a Virtuoso,* in the *Essay in Defence of the Female Sex.*

T

the

the Shore to throw away again, as *Caligula's* Soldiers did upon the *Batavian* Coast, when they should have been transported into *Britain*. There would have been a stop put to the Progress of Learning long ago, if immediate Usefulness had been the sole Motive of Men's Enquiries. Whatsoever our Great Creator has thought fit to give a Specific Being to, is, if accessible, certainly worth our searching after. And though we do not see the present Advantage that will accrue to Mankind by the Discovery of this or that particular Species of Minerals, Stones, Plants, or Insects, yet Posterity may; and then all the Returns for the Uses that they can ever make of them, will be in a great measure due to him that found them out. He that first pick'd up a *Magnet*, and perceived that it would draw Iron, might then perhaps be laugh'd at, for preserving a Child's Play-thing; and yet the Observation of that noble Quality, was necessarily previous to the succeeding Observations of its constant pointing towards the North, which have proved so unspeakably useful in Civil Life. So that I think all these excellent Men do highly deserve Commendation for these seemingly useless Labours, and the more, since they run the hazard of being laugh'd at by Men

Men of Wit and Satyr, who, always have their End, if they make their Readers Sport, whether the thing which they expose, deserves to be ridiculed or not.

But it is time to leave this Argument, when I have observed, that all that has yet been published concerning the *formed Stones, Shells and Petrifications* found in and upon the Earth, will seem but Gleanings, in comparison of that vast Collection which those excellent Naturalists, Mr. *Edward Lhwyd* of Oxford, and Dr. *Woodward* have promised shortly to present the World withal.

CHAP. XXI.

Of Ancient and Modern Histories of Plants.

THE *Natural History of Plants* comes next; which, for Variety and Use, is one of the noblest and pleasantest Parts of Knowledge. Its Mechanical and Medicinal Advantages were early known. Fruits afforded the first Sustenance to Mankind; and the old Heathens esteemed those worthy of

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Consecration, who taught them to Till their Grounds, Gather their Seed, and Grind their Corn: With Trees they built themselves Houses; afterwards they found that the Bark of some Plants would serve for Cloaths; and others afforded Medicines against Wounds and Diseases. There is no doubt therefore, but this Part of Knowledge was sufficiently cultivated for the Uses of Humane Life; especially when Mankind becoming numerous, those that were inquisitive communicated their Notions together, and Conversation had introduced the Arts of Luxury and Plenty into the World. Even in *America*, where most of the Nations which the *Europeans* discovered were Salvage, and all Unlearned, the Natives knew the Oeconomical and Medical Uses of many of their noblest Plants. They made Bread of their *Mayz*, and the Roots of *Tucca*, some imoaked *Tobacco*, some poisoned their Arrows with the Juice of one Plant, others made their *Chocolate* with the Seeds of another, some clothed themselves with *Cotton*, others cured *Agues* with the *Cortex*, and Venereal Diseases with *Gajacum*, and almost every other sort of Disease to which they were incident with some Specific or other, which Use and Experience had taught them. But whether the *Natural History*

of Plants was yet notwithstanding all this, not exactly known formerly, as it is at present, is the Question.

The ancientest Writers of Plants now extant, are *Theophrastus*, *Pliny*, and *Dioscorides*; indeed, the only ones who say any thing considerable to the present Purpose. *Theophrastus* describes little; gives abundance of Observations upon several Plants, and the like; but what he says, is rather to be taken notice of when we speak of *Agriculture* and *Gardening*, than in this place. *Pliny* and *Dioscorides*, who lived long after him, give Descriptions indeed of a great many Plants, but short, imperfect, and without Method; they say, for Instance, that a Plant is hairy, has broad Leaves, that its Stalks are knotty, hollow, or square; that its Branches creep upon the Ground, are erect, and so forth; in short, if there is any thing remarkable in the Colour or Shape of the Stalk, Root, Seed, Flower or Fruit, which strikes the Eye at first sight, it may perhaps be taken notice of, but then every thing is confused, and seldom above one or two Plants of a sort are mentioned; though sometimes later *Botanists* have observed some Scores plainly reducible to the same general Head. *Pliny* ranges many of

the Plants, which he describes in an Order (u) something Alpha-

(u) N. H. l. 12. c. 13. and l. 27. throughout.

(w) The 12th. Book is chiefly of Plants which bear odoriferous Gums, and so on of all the rest.

(x) N. H. l. 25. c. 6, 7. *et alibi passim.*

betical; others (w) he digests according to their Virtues; others (x) he puts together, because they were discovered by great Persons, and called by their Discoverers Names:

All which Methods, how much soever they may assist the Memory in remembering hard Names, or in retaining the *Materia Medica* in one View in a Man's Head, signify nothing to the Understanding the Characteristical Differences of the several Plants; by which alone, and not by accidental Agreements in Virtue, Smell, Colour, Taste, Place of Growth, Time of Sprouting, or any Mechanical Use to which they may be made serviceable, Men may reasonably expect to become exact *Botanists*: Without such a Method, to which the Ancients were altogether Strangers, the Knowledge of Plants is a confused thing, depending wholly upon an uncommon Strength of Memory and Imagination, and even with the Help of the best Books scarce attainable without a Master, and then too not under a very long Time.

Conradus Gesner, to whose Labours the World has been unspeakably beholden in almost

almost all Parts of Natural History, was the first Man (that I know of) who hinted at the true Way to distinguish Plants, and reduce them to fixed and certain Heads. In a Letter to *Theodorus Zuingerus* (y), he says, that Plants are (y) *Epist. Medicinal.* to be ranged according to the Shape of P. 113. 4. their Flowers, Fruits and Seeds; having observed that Cultivation, or any accidental Difference of Soil, never alters the Shape of these more Essential Parts; but that every Plant has something there peculiar, by which it may be distinguished, not only from others of a remoter Genus, but also from those of the same Family.

About the same time, *Andreas Cæsalpinus*, and *Fabius Columna*, the first especially, reduced that into an Art, which *Gesner* had hinted at before. The first of these, divided the whole Body of Plants, then known, into Classes, from the Number and Order of their Seeds and Seed-Vessels, and drew up a History accordingly. But his Method was too general; and because it took too little notice of the *Roots, Leaves, Stalks, and Perianthia* of Plants, which in some Tribes ought necessarily to be considered, it was long laid by as useless; though *Glasius, Gaspar Bauhinus, Parkinson, Gerard, and*

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(y) *Epist. Medicinal.*
P. 113. a.

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(1) Vid.
Morison.
Prelud. Bo-
tanica. p.
403.

Johnson, and John Bauhinus, had taken very laudable Pains, not only in describing the more general Sorts taken notice of by the Ancients, but also in observing their several Sub-divisions with great Niceness and Skill. Gaspar Bauhinus, who spent Forty Years in completing his *Pinax*, or *General Index* to all the Botanical Writers, Ancient and Modern, that had appeared before him, ranged the whole System of Plants, then known, into such Classes as he thought properest. Yet tho' his Method is allow'd to have been the best, setting *Cæsalpinus's* aside, which had till then been made use of, (2) it was far from being Natural, and accordingly has never since been follow'd. John Bauhinus also had described every particular Plant then known, in his *General History of Plants*, with great Accuracy; and compared whatsoever had been said by former Botanists, and adjusted old Names to those Plants which Modern Herbarists had gathered, with so much Care, that the Philological Part of *Botany* seems by him to have, in a manner, received its utmost Perfection.

The great Work therefore already begun by *Cæsalpinus* and *Columna*, was still imperfect; which, though perhaps not the most Laborious, was yet the most Necessary

Necessary to a Man that would consider those things Philosophically, and comprehend the whole Vegetable Kingdom, as the Chymists call it, under one View. This was, to digest every Species of Plants under such and such Families and Tribes ; that so, by the help of a general Method (taken only from the Plants themselves, and not from any accidental Respects, under which they may be considered) once thoroughly understood, a Learner might not be at a loss upon the Sight of every new Plant that he should meet with, but might discern its general Head at first View ; and then, by running over the Tables thereunto belonging, might, at last, either come to the particular Species which he sought for, or, which would please him much better, find that the Plant before him was hitherto undescribed, and that by it there would be a new accession made to the old Stock. Mr. Ray drew a rough Draught of this Matter, in the *Tables of Plants* inserted into Bishop Wilkins's his Book, *Of a Real Character, and Philosophical Language* ; and was soon followed by Dr. Morison, in his *Hortus Regius Blesensis*, who, pursuant to his own Method, (which, indeed, is nothing else but *Andreas Cæsalpinus's* a little alter'd,) began *A General History of Plants* ; which
he

he not living to finish, Mr. Ray undertook the whole Work anew, and very happily compleated it.

This great Performance of his, which will be a standing Monument of Modern Industry and Exactness, deserves to be more particularly described. First, therefore, He gives an Anatomical Account, from *Malpighius* and *Grew*, of Plants in general: And because the Ancients had said nothing upon that Subject, of which, for want of Microscopes, they could have but a very obscure Notion, all that he says upon that Head is Modern. Afterwards, when he comes to particular Plants, he draws up Tables, to which he reduces the whole Vegetable Kingdom, except some few irregular Plants, which stand by themselves. These Tables are taken from the Shape and Colour of the Flowers, Seeds, Seed-Vessels, Stalks, Leaves and Roots; from the Number or Order of these when determined, and Irregularity when undetermined; from the want, or having of particular Juices, Lympha's, Milks, Oils, Rosins, or the like: In short, from Differences, or Agreements, wholly arising from the Plants themselves. His Descriptions are as exact as *John Bauhin's* every where; since he copy's him where others have not described a Plant, better than

than he ; and always supplies, with great Nicety and Art, what was wanting in their Descriptions : We may be sure therefore that here has been a gradual Improvement ; for *John Bauhine's* Descriptions are much better than those of the generality of Botanists that were before him ; and there are scarce any of theirs, which are not preferable to those of *Pliny* and *Dioscorides* : He gives the *Synonyma* of the most exact and best known Botanists ; the want of adjusting which carefully, had made former Compilers tedious ; and by inserting what was already extant in the *Malabar Garden*, *Boym's Flora Sinensis*, *Marcgravius's Natural History of Brasil*, *Hernandez's Account of the Plants of Mexico*, *Cornutus's History of the Plants of Canada*, and other *Indian Accounts of Natural Rarities*, into his General History, has shewed, that the Moderns have been as careful to compleat the Natural History of remoter Countries, as to understand the Productions of their own.

Before I quit this Work of Mr. Ray's, which is but one of the many Labours that he has happily gone through to enlarge the Bounds of Natural Knowledge, I must observe what he delights so much to have remembred ; That a considerable part of the Debt which Posterity will owe to this excellent

excellent Naturalist, will be due to the Assistances which he has for many Years received from my most Learned Friend Dr. *Tancred Robinson*, whose Skill in all Parts of Physical Knowledge have long made him capable of performing whatsoever he should think fit to undertake in that sort of Learning, and consequently of enlarging the Bounds of our Knowledge as much as any of those great Men who have been here remembered.

It may be wonder'd at, perhaps, why I should mention Modern Discoveries of Natural Knowledge in the *East* and *West-Indies*, since the Ancients were not to be blamed for being ignorant of Things which they had no Opportunity of knowing. But, besides that it proves the Extent of the Knowledge of the present Age in Natural History, which may be considered, without any regard to the Opportunities of acquiring it; it proves also, against Sir *William Temple*, that the Moderns have done what they could in every Point, to make the greatest Use they were able of every Addition to their former Knowledge, which might accrue to them by the Discovery of the Usefulness of the *Load-stone* in Navigation: His words are these; (a) *The vast Continents of China, the East and West-Indies, the*
long

(a) P. 49.

long Extent and Coasts of Africa, have been hereby introduced into our Acquaintance, and our Maps; and great Encreases of Wealth and Luxury, but none of Knowledge brought among us, further than the Extent and Situation of Countrey, the Customs and Manners of so many Original Nations. — I do not doubt but many great and more noble Uses would have been made of such Conquests, or Discoveries, if they had fallen to the Share of the Greeks and Romans, in those Ages, when Knowledge and Fame were in as great Request as endless Gains and Wealth are among us now: And how much greater Discoveries might have been made by such Spirits as theirs, is hard to guess. Sir William Temple here owns, that the Political Uses which can be made by such Discoveries, are inconsiderable; though, at the same time, he confesses, that even those have not been neglected, since he acknowledges that Men have brought from those Barbarous Nations an Account of their Customs and Manners; which is the only Political Use, that I know of, that is to be learnt by Travel. What other Advantages might have been made, is hard to tell, unless such as may conduce to the Compleating of Natural History; the Benefits whereof are agreed upon, of all Hands, to be very great. The Subject
now

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now before me is *Botanics*, which has been so far from being neglected, that all imaginable Care has been taken to compleat it. Monsieur *Herman* spent several Years in the *East-Indies*, and at the *Cape of Good Hope*, to bring back into *Europe* an Account of the Natural Rarities of those Countries; and his Writings since his return, shew that he did not lose his Time. Monsieur *Van Rheed*, the noble Collector of the Plants that are so magnificently printed in the Eleven Volumes of the *Hortus Malabaricus*, has added more to the Number of those formerly known, than are to be found in all the Writings of the Ancients. As much may be said of that Excellent Collection of Exotic Plants which Dr. *Plukenet* has since given us in his incomparable Tables, besides great Numbers before undescribed, of which he has set down Characteristical Marks in his *Botanical Almagest*. Nay, this ought further to be added in his Commendation; That coming after those who had newly done so great Things before him, such a Harvest where small Gleanings were rationally to be expected, is more surprizing and extraordinary. When (b) Prince *Maurice* of *Nassau* was in *Brasil*, he ordered Pictures and Descriptions to be taken of all the Beasts, Birds, Fishes and

(b) *Ment-
gel. Index
Plantar.
Multiling.
in Praef-
atione.*

and Plants that could be found in that Country: They are now in the Elector of Brandenburg's Library fit for the Press. But I must not forget Dr. Sloane's Catalogue of the Plants of Jamaica, and the Caribbee Islands, a Specimen only of a larger Work, which when once it appears, will (if we had no other Arguments) effectually confute all those who imagine that *Wealth* and *Luxury* only have been the Motives of *European* Voyages into the *New World*. Since I may venture to say, that there is but a very small Part of the *Old* so well known, after so long study, as those Islands, as to all their Natural Productions, will then be, through the Labour and Skill of that industrious Naturalist. And if Mr. Banister had lived to have compleated his Enquiries into the *Natural History* of *Virginia*, we should have had another Instance of our own Nation, how very Laborious and Careful the Men of these later Ages have been to leave no part of accessible Knowledge uncultivated. Every Day New Additions are made to this Part of Natural History. Breynius's, Plumier's, and Herman's Collections, are Modern to those of Bellonius, Clusius, Rauwolfius, and Prosper Alpinus; as theirs are to those of Pliny and Dioscorides. One is also to consider, that this is a much more

more laborious Business, than the Knowledge of Fowls, Fishes, and Quadrupeds. The Confusion in which the Ancients left *Botanical Knowledge*, shews how little they understood it. And, which is still more remarkable, it is not only in Accounts of Plants peculiar to the *Indies*, or to *China*, that our *Botanical Knowledge* excels theirs, but in the Productions of Countries, equally accessible to them, as to us. There are no new Species in *Europe* or *Asia*, which the Ancient Herbarists could not have discovered; no new Soils to produce them without Seed, in case such a thing were ever naturally possible. Let but a Man compare Mr. Ray's Catalogue of *English Plants*, and those other numerous Catalogues of the Plants of other Countries, drawn up by other Modern Botanists, with the Writings of *Pliny* and *Dioscorides*; let him examine Ray's *General History*, or, if that be not at hand, Gerard's, Parkinson's, or John Bauhin's *Herbals*, or Gaspar Bauhin's *Pinax*; and deduct every Plant, not growing wild, within the Limits of the *Roman Empire*, and he will see enough to convince him, that not only this Part of Knowledge is incomparably more exact and large than it was formerly, but also, by comparing the Writings of the first Restorers of the

Know-

Knowledge of Simples, *Matthiolus*, *Dodoneus*, *Fuchsius*, *Turner*, and the rest, with the Writings of *Plukewet*, *Ray* and *Morison*, that it has been always growing, and will do so still, till the Subject be exhausted.

It is well known, that Travelling in *Mahometan* Countries is extremely dangerous, that it is what no Man that makes Learning his Aim in Journeying, would willingly undertake, if he were not ardently possessed with the Love of it. So that whatsoever Perils the *Ancient Sages* endured in their Journeys into *Egypt* for Knowledge, they are equalled at least, if not out-done by our *Modern Sages*; to use that word, in *Sir William Temple's* sence, for one that goes far and near to seek for Knowledge. Nay, I may safely add, that a few inquisitive and learned Travellers, such as *Ramvolfius*, *Prosper Alpinus*, *Bellonius*, *Guilandinus*, and *Sir George Wheler*, have acquainted the learned Men of these Parts of the World with the Natural History of the Countries of the *Levant*, not only better than they could have known it by reading the Books of the *Ancients*, but, in many Particulars, better than the *Ancients* themselves, *Natives* of those very Countries, knew it, if the extant Books can enable us to give a

competent Judgment in this Matter. And if Travelling far for Knowledge, be sufficient to recommend the Ancients to our Imitation, I may observe, that Mr. *Edmond Halley*, who went to *St. Helena*, an Island situate in the *XVIth* Degree of Southern Latitude, to take an Account of the Fixed Stars in the Southern Hemisphere, which are never visible to us who live in the Northern; and to *Dantzick*, to confer about Astronomical Matters, with the great *Hévelius*, has taken much larger Journeys than any of the Ancients ever did in the sole Pursuit of Knowledge.

CHAP. XXII.

Of Ancient and Modern Agriculture and Gardening.

THE Ancients put so great a Value upon the Country-man's Arts, and we have so many Treatises still extant concerning them, written by their greatest Philosophers, their ablest Philologers, and their best Poets, that to say nothing of them, may be thought an inexcusable Omission.

Omission. *Husbandry* and *Gardening* are Subjects upon which *Theophrastus* (*Aristotle's* Darling Disciple,) *Varro* (who is said to be the learnedest of all the *Romans*;) and *Pliny* (perhaps no way his inferior) have written large Discourses yet remaining. *Varro* and *Pliny* quote numbers of Authors, some of them no less than Crowned Heads, since lost. *Hesiod*, whom some of the Ancients make older than *Homer*, and *Virgil* the Prince of *Roman Poets*, have left us Precepts of these Arts. *Columella* says, they are related to Philosophy it self, which those Heathen Sages priz'd so highly : And the later *Roman Writers* are still upbraiding the Luxury of their own Times, which wholly took off their Minds from these most useful Employments, and sending their effeminate Country-men back to their renowned Ancestors who went from the Plough to the Camp, and having there commanded victorious Armies, returned back again to the Plough, to redeem the Time they had lost.

There is no doubt but great Things were done in these Arts by the Ancients : Had we no Books extant to acquaint us with their Knowledge, yet the thing shews it self : Countries cannot be peopled by Civilized Nations, nor great Cities filled,

nor Trade carried on by polite and industrious Inhabitants, unless the Arts of Husbandry flourish. Mankind, without them, would be Wild, like the *Negroes*, and *American Salvages*, or *Arabs*. But yet one Nation may be much more Knowing in these Things than another, and one Age consequently, though all may have Skill enough to answer the Necessities of Civil Life.

In making my Comparison, I shall comprehend all that the Ancients understood by their *Res Rustica*, as it takes in the *Forester's*, the *Husbandman's*, and the *Gardener's* Business: *Cato*, *Varro* and *Columella* include the *Grasier's* also, thereby compleating the whole Body of *Farming*; but since his Work cannot well be made a Science of, I shall omit it.

By a *Forester* here, I understand one that knows how to Plant, Propagate and Encrease all sorts of Timber Trees; what Soils are proper for every sort; how they may best be defended from Dangers in their Growth; to what Uses they are most applicable, when they have arrived to their utmost Perfection; and how they may be best applied: Such a Man, in short, as Mr. *Evelyn* instructs in his *Silva*, where he gives a full System of the *Wood-man's* Skill, what he ought to

know,

know, and what to practise. A great part of his Work, and indeed the Nicest part of it, the Ancients were Strangers to, as having less Occasion for it. The World was then, comparatively speaking, in its Infancy; there was no want of Wood, for Fuel, Building, or Ships; and this Plenty made Men less curious in Contriving Methods of Preserving what they had in so great Abundance. *England*, till within a few Ages, was every where overrun with Wood: The *Hercynian* Forest anciently took up what is now the most flourishing Part of *Germany*: And *France*, which is at present so wonderfully Populous; that little Cultivable Ground remains Untill'd, was in *Cæsar's* time overspread with Woods and Forests. As Men encrease, Tillage becomes more and more requisite; the consumption of Wood will be proportionably greater; and its want, and the necessary Uses of Timber, which grow upon Men as they become more numerous, will of consequence put them upon Ways to preserve and encrease it. Commerce with distant Parts, will shew Men rare and useful Trees, to which their own Soil was before a stranger; and Luxury will soon teach them to transplant them.

No wonder therefore if Modern Writers excel the Ancients, upon a Subject which they had less Occasion for. The Romans, indeed, were Curious in Planting Trees for Shade or Fruit; but their Industry in that Particular comes under another Head, as rather belonging to the Gardener's Work. It may therefore, perhaps, be esteemed a small Character of Mr. Evelyn's *Discourse of Forest Trees*, to say, that it Out-does all that *Theophrastus* and *Pliny* have left us on that Subject: For it not only does that, and a great deal more, but contains more useful Precepts, Hints, and Discoveries upon that now so necessary a part of our *Res Rustica*, than the World had till then known from all the Observations of former Ages. To name others after him, would be a Derogation to his Performance.

Agriculture properly so called, has been always necessary since *Noah's* time, when the Flood, that destroy'd the World of the Ungodly, wrought such a Change upon the Face of the Earth, as made it necessary for all Mankind in the sweat of their brows to eat their bread. And the early Populoufness of the Eastern Nations, (though I would not bring *Semiramis* and *Zoroaster's* Armies to prove it) shews how much it was followed. For though those Coun-
tries

tries should be allowed to be, as they really are, marvellously Fruitful; yet even *Egypt*, and the Plains of *Babylonia*, must be Tilled, to yield a Crop to satisfy the Hunger of their Inhabitants. Westward, as the World was later Peopled, so Tillage was proportionably later; and the *Athenians* tell of one *Triptolemus*, who learn'd the Art of Sowing Corn of the *Egyptians*, above M Years after *Noah's Flood* (c). After that, Necessity taught them many Rules; and it is evident from *Theophrastus*, and the *Roman Writers* of *Geoponic's*, that their Knowledge in this kind was very great. They were thoroughly versed in the Art of Dressing their Grounds, and the Seasons when it was proper to do every part of a Husbandman's Work; what Compost was fit to meliorate their over-wrought or barren Lands; what Soil was best for this Grain, and what for that. Their Vines and Olives, which were their Farmer's Care, were managed with much Skill and Curiosity; and *Pliny* reckons up a great many sorts of both of them, which the Luxury of that Age had taught them to Cultivate. In a word; They were Industrious, and Skilful Husbandmen; and perhaps, 'tis not possible to tell, at this distance, whether our Farmers manage their Grounds more judiciously

(c) Vid.
Marshani
Chronicon.
pag. 249.
Edit. Lond.

than they did theirs. Since any Improvements particular to one Climate and Soil, do not prove that Age in which they are made, more Knowing than another, where in such Improvements could take no place: Though at the same time, a Country naturally barren, which has a weak Sun in an unkindly Climate, requires more Skill, as well as more Industry, to make it Fertile. And therefore it may be question'd, whether, considering the Natural Felicity of the Soils of *Sicily, Africa and Greece*, and much more of *Egypt, Judaea and Babylonia*, whose Fertility was anciently, with Reason, so much extoll'd, the Improvements in *England, Scotland and Holland* may not justly come into Competition with any ancient Performances, which how great soever in themselves, were yet less upon this Account, that the Husbandmen in those Regions had not such Difficulties to struggle with.

But though the Ancients, probably, understood the Art of Sowing Wheat, and Barly, and Legumes, and Flax, and how to Manage their Vines and Olives, as well as any Age has done since; yet other Things of unspeakable Use they were wholly Strangers to. The Art of Making Cydar, at least of Chusing the best Apples, and Managing their Orchards and

and Plantations accordingly, they knew little or nothing of. And here again I must remember to take notice, (which, upon every Opportunity, I gladly do,) that Mr. *Evelyn's Pomona* has taught the present Age many things concerning the way of Ordering Apple-Trees, and Making Cydar, to which the World, till then, were wholly Strangers, and for which he ought here to be mentioned with Honour. The *Sugar-Cane* was not anciently unknown, since it grows naturally in *Arabia* and *Indostan*; but so little was the Old World acquainted with the Nature of its delicious Juice, that some of their ablest Men doubted whether it were a Dew like Manna, or the Juice of the Plant it self. All the Arts and Methods therefore of Preparing *Sugar*, which have made it so very Useful to Humane Life, are owing to Modern *Portuguezes* and *English*. *Malt Drinks* were used in *Gaul* and *Spain* anciently, as also in *Ægypt*, where, probably, they were first invented; but whether they were so accurately made as ours, no Man can tell, unless he knew certainly whether and with what they fermented them. May I not farther instance in *Coffee* and *Tobacco*? The *Romans* drove a greater Trade in *Arabia*, and were better acquainted with its Commodities, than this Part of the World

World has been at any time since, which no Man that has ever read the *XIIIth* Book of *Pliny's Natural History* can possibly doubt of; yet there is no one Syllable of any thing like *Coffee* in his whole Work, nor indeed in any other Ancient Author before the *Arabs*. It is very probable that it grows wild in *Arabia*, since it is known to grow no where else; and that the Prohibition of Wine by the *Mahometan Law*, made the *Arabs* find out its Virtues, (whereas before it was a neglected Shrub) to supply the place of the other Liquor. But still its Cultivation is, as to the present Question, Modern; and since the *Arabs* do now bestow great Care and Pains in Managing it, it comes not improperly in among the Augmentations of *Modern Agriculture*. And that *Tobacco* ought here to be mentioned, is question'd by none who know what a Delight and Refreshment it is to so many Nations, so many several Ways. The Accounts of *Virginia* and *Brazil* will inform us what Pains our *European Planters* are at, to make that Herb Palatable to all sorts of Persons. So that without taking notice of any more Particulars, we may be assured, that the *Modern Husbandry* is a larger, if not a more exact thing than the *Ancient*; and even in those things wherein

wherein the Ancients did most excell, in the Management of their Vines and Olives, the comparative Excellency of the later Ages will perhaps be allowed by all those who are acquainted with the Curiosity of the present, in Managing of their Fruit-Trees; which shall be treated of in its proper Place.

I deferred to speak of *Gardening* till the last; because Luxury always comes after Necessity, though, generally, when it is once introduced, it still goes on encreasing, till it is come to the utmost pitch to which it can be carried. In the present Subject, we shall find a gradual Improvement so very visible, that I hope to put it past Controversie.

The Babylonian *Horti Penfiles*, or Gardens on the tops of Buildings, ought, in most Men's Opinion, first to be mentioned in point of Antiquity: These, *Josephus* assures us, were only large Walks of Trees planted on the tops of Mounts of Masons Work, erected in the midst of the City by *Nebuchadnezzar*, to please his Wife. If they are no older, *Alcinous's* Garden, described by *Homer* (d), was long before them. There one sees the Simplicity of that Heroical Age very plainly. The Poet thought he did a magnificent Thing, when he made it Four Acres

(d) *Odyss.*
lib. viii.

Acres in Circumference : He tells us, it was stored with Pear-Trees and Apple-Trees, Pomegranates and Figs, Vines and Olives, which furnished him with constant successions of Fruit ; and had two Fountains, one cut into Streams, to water it within, the other flowing from thence, to supply the Necessities of the Inhabitants of the Town. And this is all he says of it : Poets and Romancers describe every thing for their Hero's Uses, as splendidly as they can, what they have seen, read, or heard of, is always brought in, as 'tis expected it should. Accordingly the Garden described by *Eustathius* (e), in the later times of the *Græcian* Empire, when Luxury was improved into an Art, which it was far from being in old *Homer's* time, is much finer, though far short of the Gardens and *Villa's* of the Princes and Great Men of the present Age. *Eustathius's* Garden has open and arched Walks of Lawrel, Cypress and Myrtle, with Arbors of Vines for the Conveniencies of the Guests, to gather the Grapes as they lay at their Meals by the Fountain-side ; with a *Fet d'eau* in the middle of it, spouting Water out of an Eagle's Bill ; by which a She-Goat was milked, with the Liquor dropping out of the Nipples into a Pail on purpose : round the Fountain are Swal-

(e) *Amor-
um Timi-
nia & Ti-
mines*, l. i.

lows

lows and Peacocks, Doves and Cocks, all either Cast or Carved, out of whose Bills the Water flowing, gave a Sound to the several Birds. This indeed is very Pleasant and Poetical, and shews, that *Eustathius* had seen or heard of something of this nature, by which he guided his Fancy.

What the *Roman* Gardens were, we are sufficiently taught by their Writers of *Country Affairs*: (f) *Columella's* and (g) *Pliny's* Precepts and Descriptions are fit for nothing else but a Kitchen-Garden: They give Directions for Ordering Cucumbers, Melons, Artichokes, Coleworts, Turneps, Radishes, Parsnips, Skirrets, Garlick, Leeks, Onions, Asparagus, and a numerous train of Pot-Herbs, with a little Garden-Physic. They both assign this as the Reason why *Virgil* would say nothing of Gardening, in his *Georgic's*, it being a Subject so very poor and jejune, that it would not bear the Ornaments which that Divine Poet gave to all his Works: So they seem to understand his *Spatia iniqua* which he complains of, upon which account he left off where he did.

For if we fantasie that the Gardens of *Lucullus*, *Pompey*, *Cicero*, *Mecænas*, *Seneca*, and of all those Great *Romans* which are so highly extolled by the Ancients, were what we ordinarily call Gardens, we are very much mistaken: Their Gardens were spacious

(f) Lib. x.
101. &
lib. xi.
cap. 3.
(g) Lib.
xix.

spacious Plats of Ground, filled and surrounded with stately Walks of Plantins, and other shady Trees, built round with Xysti, Portico's, finely paved with curiously coloured, and far-fetch'd Marble, lay'd in Artificial Figures, noble Ranges of Pillars, adorned within with Fish-Ponds, Aviaries, Fountains and Statues. Such still are the Villa's of the Italian Princes at *Frascati*, *Tivoli*, and their other delicious Seats in *Latium* and *Campania*, so celebrated of old, for being the Gardens of the *European* World. Such, in some measure, are the famous Gardens about *Ispahan*, where Shade and Coolness give them their greatest Pleasure, in a Region where the Soil naturally furnishes its Inhabitants with excellent Fruit, and fragrant Flowers: so that they are at little Pains to cultivate that which they can have without, and which would not afford half that Delight in their Gardens of Pleasure, that they find in lying, in the cool of the Day, under a shady Plane, by a Fountain-side. This made the Ancients, who all lived in warm Climates, admire the *Plane* so exceedingly, that frantic Stories are told of *Xerxes's* dotting upon one in the *Lesser Asia*, when he

(b) *Ælian*, was bringing down his mighty Armies against Greece (b). The Walks of *Artemus*,

(b) *Ælian*,
Var. Hist.
2. 14.

demus, and the Gardens of *Epicurus*, were of this sort, Cool and Delicious, but which can give us no Idea of the Artificial Beauties of Modern Gardens. For the Question is not, which is in it self pleasanter, or whether if we lived in *Greece* or *Persia*, we should not rather chuse to imitate the Fashion of those Countries; but, which shews the greatest Skill of him that makes it.

The Gardens of this Age are of several sorts, for the *Kitchen*, for *Flowers*, for *Greens*, and *Shady Walks*, for *Fruit-Trees*, and for the *Apothecary*.

To the First of these, the Industry of the Ancients (as we have seen already) was in a manner wholly confined. That they knew how to Manage those Kitchen Stores which their Gardens yielded, is unquestionable; but their Variety was not near so great, since neither was the New World known, nor the Old so well examined as it has been since. Besides, they knew little of the Art of Raising Summer Plants, in the severest Frosts, and so making all Seasons of the Year unite in one, at Great Men's Tables; the bringing which to the present Perfection, is due to the Industry and Sagacity of the Age we live in; which how much it has enlarged this part of Gardening from what

what it was anciently, every Man by himself will easily imagine. The *Romans*, indeed, had a Way of Preserving Melons in Winter, by Sowing them in a large Box fill'd with rich Mold and Dung, which they housed in Winter, and exposed in Sun-shiny Days under their *Sperularia*, that seem to have been of the Nature of our Glasses; by which Contrivance, *Tiberius* the Emperor had Melons all the Year round. That shews what Necessity might have forced them to, had they been put to it.

As for *Flower Gardens*, the Ancients minded them not. They require an open Sun, and a free Air, which in hot Countries would have been Nuisances, rather than Delights. Plants remarkable for their Beauty, or their Smell, had a Place, indeed, in their Plantations; but we find no mention of any great Variety of Species, or Art in Ranging or Managing those they had. There is nothing said in any *Greek* or *Roman* Authors of large Gravel-Walks, surrounding spacious Grass-Plats, edged with beautiful Borders, fill'd with all that Choice of Auricula's, Tulipa's, Carnations, Tuberoses, Jonquilles, Lily's, Hyacinths, Narcissus's, and that almost infinite Diversity of Beautiful and Odoriferous Flowers that now adorn our
Gardens.

Gardens. They knew not the Art of Diversifying the Colours, Enlarging the Flowers, and giving them all those sickly or luxuriant Beauties which are so commonly to be met with in our Gardens. Some Notion they had of Managing *Dwarf-Trees*, and Clipping other Trees that would bear it into what Form the Gardeners please; but they speak so little of it, that we have no reason to think they understood much of that beautiful Furniture which *Dwarfs* and *Ever-greens* afford us.

The Usefulness of *Fruit-Trees* made them be anciently more regarded. The Vines and Olives of the Ancient Greeks and Romans we have mentioned already. They had several sorts of Apples, Pears, Quinces, Peaches, Pomegranates, Plums, Figs and Nuts: As for Oranges and Limons, and the delicious Fruits of the *East* and *West-Indies*, they were wholly Strangers to them. And they had not near the Variety of those they knew, with which Monsieur de la Quintinie, were they now alive, could furnish them. Though they had many Precepts concerning Pruning, Setting, Grafting and Inoculating, knew their Usefulness, and could perform all those Operations with Success; yet, comparatively speaking, their Manner was coarse; and had their Climates been as

unkindly, their Success would have been but indifferent. They could Manage Earth, and Air, and Water, pretty tolerably; but how to bring the Sun under Rules, (if I may use so bold an Expression) they knew not; which yet, by their Wall-Plantations, our Gardeners do every Day. That is an Invention the Ancients were entirely unacquainted with; thereby, in Cold Countries, we can command the Warmth of *Italy* and *Spain*, and have Fruits of a Bigness, and Colour, and Taste, which even at Home they can scarce reach.

It will not be hard now, with due Allowances, to make a just Comparison between *Ancient* and *Modern Horticulture*. Monsieur de la Quintinie will give us a full and just Idea of what the Skill of this Age can reach to: Mr. Evelyn's *Kalendarium Hortense* ought to be joined with it, to shew the Difference in a more Northern Clime. What Variety our Florists can pretend to, will appear from *Parkinson's Paradise*, *Ferrarius's Flora*, or *Sweertius's Florilegium*. In those Books one may see what Art can do, to beautify and enlarge Flowers beyond what Nature ordinarily produces. Other Men can only follow Nature; the Gardener alone leads it, and hastens or slackens its

pace according as suits best with his Designs or Inclinations.

I need say nothing of the *Physic-Garden*, since what has been said already in the fore-going Chapter enables every Man to judge there aright. So much for the Knowledge of Things not endued with *Sensible Life*.

CHAP. XXIII.

Of Ancient and Modern Histories of Animals.

Insects seem to be the lowest and simplest Order of Animals; for which Reason I shall begin with them. That some are very beneficial to Man, affording him Food and Rayment; as, the *Bee*, and the *Silk-Worm*: And others, again, exceedingly troublesome; as, *Wasps*, *Hornets*, *Gnats*, *Flies*, and abundance more; was formerly as well known as now. In their Observations about *Bees*, the Ancients were very curious. *Pliny* (i) mentions one *Aristomachus*, who spent *LXIII* Years in Observing them: And it is evident from Him, *Aristotle* and *Ælian*, that, as far as they could make their Observa-

(i) N. H.
l. 11. c. 9.

tions, the Ancients did not neglect to digest necessary Materials for the Natural History of this wonderful and useful Insect. They were so particularly careful to collect what they could gather concerning it, that it is to be feared, a great part of what they say, is fabulous.

But if they were curious to collect Materials for the History of this single Insect, they were, in the main, as negligent about the rest. They had, indeed, Names for the general Sorts of most of them; and they took notice of some, though but few, remarkable Sub-divisions. The Extent of their Knowledge, in this Particular, has been nicely shewn by *Aldrovandus* and *Mouset*. In their Writings one may see, that the Ancients knew nothing of many Sorts; and of those which they mention, they give but indifferent Descriptions; contenting themselves with such Accounts as might, perhaps, refresh the Memories of those who knew them before, though they could signify little to Persons who had never seen them. But of their Generation or Anatomy they could know nothing considerable, since those things are, in a great measure, owing to Observations made by Microscopes; and having observed few Sub-divisions, they could say little to the Ranging of those

those Insects which they knew already by distinct Characteristics, under several Heads. For want of observing the several Steps of Nature in all their Mutations, and taking notice of the Sagacity of many sorts of Insects, in providing convenient Lodgings for themselves, and fit Harbours for their young ones, both for Shelter and Food, they often took those to be different, which were only the same Species at different Seasons; and those to be near of Kin, which Chance only, not an Identity of Nature, brought together.

The Clearing of all these Things is owing to Modern Industry, since the Time that Sir *William Temple* has set as a Period of the Advancement of Modern Knowledge; even within these last $\overline{\text{XL}}$ Years. It lies, for the most part, in a few Hands, and so is the more easily traced. In *Italy*,

Malpighius and *Redi* took several Parts.

Redi (k) examined abundance of general Sorts, those Insects especially which are believed to be produced from the Putrefaction of Flesh; those he found to grow

(k) Experimenta circa Generationem Insectorum.]

from Eggs laid by other grown Insects of the same Kinds: But he could not trace the Origination of those which are found upon Leaves, Branches, Flowers, and Roots of Trees. The Generation of those was nicely examined by *Malpighius*, in

his curious Discourse of Galls, which is in the II^d. Part of his *Anatomy of Plants*; wherein he has sufficiently shewn, that those Exerescences and Swellings which appear in Summer-time upon the Leaves, tender Twigs, Fruits and Roots of many Trees, Shrubs and Herbs, from whence several sorts of Insects spring, are all caused by Eggs laid there by full-grown Insects of their own Kinds; for which Nature has kindly provided that secure Harbour, till they are able to come forth, and take care of themselves. But *Redi* has gone further yet, and has made many Observations upon Insects that live, and are carried about on the Bodies of other Insects. His Observations have not been weakened by Monsieur *Leenwenhoek*, whose Glasses, which are said to excell any ever yet used by other People, shewed him the same Animals that Monsieur *Redi* had discovered already; and innumerable sorts of others, never yet thought of.

Besides Monsieur *Leenwenhoek*, there have been Two Men in *Holland* very eminent for this Business, *Goedartius* and *Swammerdam*. *Goedartius*, who was no Philosopher, but one who, for his Diversion, took great Delight in Painting all sorts of Insects, has given exact Histories of the several Changes of great Numbers of Caterpil-

Caterpillars into Butter-Flies, and Worms or Maggots into Flies; which had never before been taken notice of, as Specifically different. These Changes had long ago been observed in Caterpillars and Maggots, by *Aristotle*, *Theophrastus* and *Pliny*: But they, who acquaint us with the greatest part of what has been done in this Matter by the Ancients, content themselves with general Things. They enter not into minute Enquiries about the several Species of these Animals, which are exceedingly numerous: They do not state the Times of their several Changes. So that these Matters being left untouch'd, we have an admirable Specimen of the Modern Advancement of Knowledge, in *Goedartius's Papers* ^(l). *De In-*
sectis, Edit.
Lifter.

Still an Anatomical Solution of these Appearances was wholly unknown. What *Ovid* ^(m) says of the Metamorphoses of Insects, is suitable enough to the Design of his Poem: And there we may well allow such a Natural Change of Caterpillars into Butter-Flies, as is not to be accounted for by the Regular Laws of the Growth and Augmentation of Natural Bodies. But a Natural Historian has no need of the Fictions of a Poet. These Difficulties therefore were cleared by *Swammerdam* ⁽ⁿ⁾, who in his *General*
History ^{(n) Hist.}
General.
Insect.

History of Insects, proves, that all the Parts of the full grown Insect, which first appears in a different Form from what it assumes afterwards, were actually existent in the *Fetus*, which creeps about as a Caterpillar, or a Maggot, till the Wings, Horns and Feet, which are inclosed in fine Membranes, come to their full Growth, at which time, that Membrane which at first was only visible, dries up, and breaks; out of which comes forth the Insect proper to that Kind; which, then gendring with its like, lays such Eggs as in a seasonable Time are hatched; that so the Species, which is not generated by Chance, may always be preserved.

In *England*, Dr. *Lister* has done the most, to compleat this Part of Natural History. His *Book of Spiders*, gives an Account of great Numbers of Species of those Animals, formerly unobserved. His *Latin and English Editions of Goedartius*, have not only made that Author more intelligible, by ranging his confused Observations under certain Heads conformable to Nature, which may serve also as Foundations to enlarge upon, as more Species shall hereafter be discovered, but he has taken that Occasion of saying many new Things, pertinent to that Subject, all tending to encrease our Knowledge of those small

Small Productions of the Divine Mechanics. His *Tables of Shells*, exhibit to the Eye a surprizing Variety of those Inhabitants of the Waters, of which, comparatively speaking, the World before had no Idea. *Bonnani* publish'd a beautiful Collection of them some Years before, at *Rome*, which when compared with those mentioned in Ancient Books, does as far exceed them, as it self is exceeded by *Dr. Lister's*. And his *Anatomical Discourses of Testaceous Animals*, lately printed, have discovered several curious Things in that wonderful Tribe; some of which, though observed above *XXX* Years ago by *Mr. Ray*, yet had not been much believed, because not sufficiently illustrated by an able Anatomist.

This is what our Age has seen; and it is not the less admirable, because all of it, perhaps, cannot be made immediately useful to Humane Life: It is an excellent Argument to prove, That it is not Gain alone which biasses the Pursuits of the Men of this Age after Knowledge; for here are numerous Instances of Learned Men, who finding other Parts of Natural Learning taken up by Men, who, in all probability would leave little for After-comers, have, rather than not contribute their Proportion towards the Advance-
ment

ment of Knowledge, spent a World of Time, Pains and Cost, in examining the Excreseencies of all the Parts of Trees, Shrubs and Herbs, in observing the critical Times of the Changes of all sorts of Caterpillars and Maggots, in finding out, by the Knife and Microscopes, the minutest Parts of the smallest Animals, examining every Crevice, and poring in every Ditch, in tracing every Insect up to its Original Egg; and all this with as great Diligence, as if they had had an *Alexander* to have given them as many Talents, as he is said to have given to his Master *Aristotle*.

I shall put *Fishes, Fowls* and *Quadrupeds* together; because the Question, as it relates to the Natural History of these Animals, may be brought into a small Compass. For as to the Anatomical part, it is certain, That every Instance of the Defect of Ancient Anatomy already mentioned, is a Proof how little the Texture of the Inward Parts of all these Creatures could possibly be known, and consequently, that no old Descriptions of these Animals which should go beyond the Parts immediately visible, could have been considerable. There is hardly one eminent Modern Discovery in Anatomy, which was not first found in Brutes, and afterwards

wards examined in Humane Bodies. Many of them could never have been known without the Help of Live-Disections; and the rest required abundance of Trials upon great Numbers of different sorts of Beasts, some appearing plainer in one sort of Animals, and some in another, before the Discoverers themselves could frame such a clear Idea of the Things which they were then in pursuit of, as that they could readily look for them in Humane Bodies, which could not be procured in so great Plenty, and of which they had not always the Convenience. All which things extremely tended to the Perfecting the Anatomy of all sorts of Brutes. About the other Part, which may comprehend an Account of their Way of Living, their Uses to Humane Life, their Sagacity, and the like, the Ancients took much Pains, and went very far: And there are a great many admirable things in *Aristotle's History of Animals*, concerning all these Matters. What Helps he had from Writers that lived before his own time, we know not; if he had but little, it must be owned that his Book is one of the greatest Instances of Industry and Sagacity that perhaps has ever been given. But since the Question is not so much, whether that is an excellent Book, as, whether it is perfect; it ought to

to be compared with Mr. Willughby's *Histories of Fishes and Birds*, and Mr. Ray's *Synopsis of Quadrupeds*, as the perfectest Modern Books upon these Matters; and then it will be easie to make a Judgment. I shall not make it my self; because no Man can mistake, that compares them, though never so negligently, together. I name only *Aristotle*; because he is, to us at least, an Original Author: He had examined abundance of things himself; and though he took a great deal upon trust, yet that could not be avoided, since he had so little, that we know of, from more remote Antiquity, and it was too vast a Work for any one single Man to go through with by himself. *Aelian* and *Pliny* seem only to have Copied; and, with submission be it spoken, their Writings are *Rhapsodies* of Stories and Relations partly true, and partly fabulous, which themselves, very often, had not Skill enough to separate one from the other, rather than *Natural Histories*. From which Accusation, even *Aristotle* himself cannot wholly be excused. Though this must be said in Vindication of *Pliny*, That he neither Believed himself, nor proposed, as Credible, abundance of those strange things which he related in his *Natural History*. His Design was, to set down what-

whatsoever he had found in all his Reading, which was very diffuse, upon those Heads which he treated of. And accordingly, where ever he met with a shocking Story, he told it, indeed, (as *Gesner* and *Aldrovandus* did afterwards, though they were infinitely better Naturalists than he,) but it was in such a manner, many times, that a Reader must be exceedingly careless that is imposed upon either to believe the thing himself, or to think that *Pliny* believed it, and set it down for Credible. Which is a great deal more than, I think, can be said for *Ælian*, whose Authority is not near so good as his *Greek*, for the Elegancy of which he was extremely valued, and the more, because being by Birth a *Roman*, he had never (o) in his Life been out of *Italy*. But it is time to return.

(o) Vid.
Philostr.
de Vita So-
phist. in
Ælian.

If we would make this Comparison the easier, we should consult *Gesner* and *Aldrovandus*; or, if they are too voluminous, *Wotton De Differentiis Animalium*, who has put under one View, in several Heads, almost every thing that is to be found in any ancient Authors concerning these Things. What he has collected of the Elephant, may be compared with Doctor *Moulin's* Anatomy of the same Creature: The Ancients Observation concerning Vipers, may be read along with *Redi's* and

and Charas's. Their Anatomical Descriptions of many other Animals, may be examined with those excellent ones published by the Members of the *French Academy*, and Mr. Ray in his *Synopsis*: And then the Imperfections of the one, and the Excellencies of the other, will be clearly seen, and the Distance between each exactly stated; though perhaps this may seem too far about, since it is manifest at first sight, That no ancient Descriptions of any Creatures could be at present valuable, when their whole Anatomy was so imperfect. Some Mistakes however, might, methinks, have been prevented; the *Egyptian Sages*, sure, might have taught them, that a Crocodile moves his Under-Jaw, and not his Upper; they might soon have found, that a Lion has Vertebres in his Neck, and with them, by consequence, can move it upon occasion, and has as large a Heart as other Creatures of his Size; that a (p) Porcupine doth not shoot his long Quills upon those that set upon him; and

(p) Borellus de Motu Animalium, Part II. Prop. 219.

Fabulosa narratio passim circumfertur de Hystrice, quæ cœcæ tendens, spinas illas prælongas quibus dorsum ejus tegitur, longius ejaculatur. De hoc Animali enarrabo ea, quæ propriis oculis vidi. Hystrix non ejaculatur spinas suas prælongas, sed contumaciter eas arrectas valendo tremula percussione agitat & vibrat. Hoc quidem efficitur à pelle musculosâ, & à costulis semilunaribus, quibus interna cutis stipata est, qui radices spinarum erigunt & concutunt. Vid. quoque Rail Synopsin Animal. Quadruped. pag. 209.

several

several other things, which would have prevented several Over-sights that are not much for the Honour of *Ancient Diligence*. This would have layed abundance of fabulous Relations that are to be met with in ancient Naturalists. Their heaping up monstrous Stories, without giving distinguishing Marks, many times, to testify which they believed, and which not, is an evident Sign that they were not enough acquainted with these Creatures, to make a thorough Judgment what might be relied upon, and what ought to be rejected. For accurate Skill in these things helps a Man to judge as certainly of those Relations which himself never saw, as Political Skill does to judge of Accounts of Matters that belong to Civil Life; and a great deal better, since Nature goes in an even Course than the Wills and Fancies of Men, which alone, and not Rules of Prudence, are the Foundations of most of the Things that are transacted in the World.

CHAP.

CHAP. XXIV.

Of Ancient and Modern Astronomy
and Optics.

HAVING now gone through with the several Parts of *Natural History*, I am to enquire into the State of *Physical Mathematical and Physical Sciences*: Such as *Astronomy, Optics, Music and Medicine*. I put *Astronomy* first, because of the vast Extent and real Nobleness of its Subject; and also, because it has suffered the least Eclipse of any part of Knowledge whatsoever in the barbarous Times: For when the *Greeks* neglected it, the *Arabs*, and from them the *Spaniards*, took it up. That this Enquiry might be the more exactly made, and that the Truth might be fully and clearly stated, Mr. *Edmond Halley*, whose Labours towards the Advancement of this Science, have made him Famous in so many distant Parts of the World, did me the Favour to communicate this following Paper:

‘As for the *Astronomy* of the Ancients, this is usually reckoned for one of those Sciences wherein consisted the Learning of the *Egyptians*; and *Strabo* expressly declares,

declares, That there were in *Babylonia* several Universities, wherein Astronomy was chiefly professed; and *Pliny* tells us much the same thing: So that it might well be expected, that where such a Science was so much studied, it ought to have been proportionably cultivated. Notwithstanding all which, it does appear, That there was nothing done by the *Chaldeans* older than about CCCC Years before *Alexander's* Conquest, that could be serviceable either to *Hipparchus* or *Ptolemy*, in their Determination of the Celestial Motions: For had there been any Observations older than those we have, it cannot be doubted but the Victorious *Greeks* must have procured them; as well as those they did, they being still more valuable for their Antiquity. All we have of them, is only Seven Eclipses of the Moon, preserved in *Ptolemy's Syntaxis*; and even those but very cursorily set down, and the oldest not much above DCC Years before Christ: so that after all the Fame of these *Chaldeans*, we may be sure that they had not gone far in this Science; and though *Callisthenes* be said, by *Porphyry*, to have brought from *Babylon* to *Greece*, Observations above MDCCCC Years older than *Alexander*, yet the proper Authors making

no Mention or Use of any such, renders it justly suspected for a Fable. What the Egyptians did in this Matter is less evident, no one Observation made by them being to be found in their Countryman *Prolemaeus*, excepting what was done by the Greeks of *Alexandria*, under 600 Years before *Christ*. So that whatever was the Learning of these two ancient Nations, as to the Motions of the Stars, it seems to have been chiefly Theoretical; and I will not deny but some of them might very long since be apprized of the Sun's being the Centre of our System, for such was the Doctrine of *Pythagoras* and *Philolaus*, and some others who were said to have travelled into these Parts.

From hence it may appear, That the Greeks were the first Practical Astronomers, who endeavoured in earnest to make themselves Masters of the Science, and to whom we owe all the old Observations of the Planets, and of the Equinoxes and Tropics: *Thales* was the first that could predict an Eclipse in *Greece*, not 100 Years before *Christ*, and without doubt it was but a rude Account he had of the Motions; and 'twas *Hipparchus* who made the first Catalogue of the Fixed Stars, not above 150 Years before *Christ*; without which Catalogue there could

could be scarce such a Science as *Astronomy*; and it is to the Subtilty and Diligence of that great Author that the World was beholding for all its *Astronomy*, for above MD Years. All that *Ptolemy* did in his *Syntaxis*, was no more but a bare Transcription of the Theories of *Hipparchus*, with some little Emendation of the Periodical Motions, after about CCC Years Interval; and this Book of *Ptolemy*'s was, without Dispute, the utmost Perfection of the Ancient *Astronomy*, nor was there any thing in any Nation before it comparable thereto; for which Reason, all the other Authors thereof were disregarded and lost, and among them, *Hipparchus* himself. Nor did Posterity dare to alter the Theories delivered by *Ptolemy*, though successively *Alhazeni* and the *Arabs*, and after them the *Spanish Astronomers* under *Alphonfus*, endeavoured to amend the Errors they observed in their Computations. But their Labours were fruitless, whilst from the Defects of their Principles, it was impossible to reconcile the Moon's Motion within a Degree, nor the Planets, *Mars* and *Mercury*, to a much greater Space.

Now in this Science to compare the Ancients with the Moderns, and so make

' a Parallel as just as may be, I oppose the
 ' Noble *Tycho Brabe*, or *Hevelius* to *Hip-*
 ' *parchus*, and *John Kepler* to *Claudius Pro-*
 ' *lemee*; and I suppose, no one acquaint-
 ' ed with the Stars, will doubt, That the
 ' Catalogue of the Fix'd-Stars made by
 ' *Tycho Brabe*, about \overline{C} Years since, does,
 ' beyond Competition, far excell that of
 ' *Hipparchus*, being commonly true to a
 ' Minute or two, when the other, many
 ' times, fails half a Degree, both in Lon-
 ' gitude and Latitude; and this is the
 ' fairlier carried, for that it was as easie
 ' for *Hipparchus* to observe the Fix'd-Stars,
 ' as for *Tycho* or *Hevelius*, had he made
 ' Use of the same Industry and Instruments,
 ' the *Telescope*, wherewith we now ob-
 ' serve to the utmost possible Nicety, be-
 ' ing equally unknown to *Tycho* as to *Hip-*
 ' *parchus*, and not used by *Hevelius*. But
 ' what may justly be expected from Mon-
 ' sieur *Cassini*, and Mr. *Flamsteed*, in this
 ' Matter, does yet further advance in Pre-
 ' ciseness, as not capable to err half a Mi-
 ' nute, though made with Instruments
 ' (q) of the Production of Gresham. As to
 ' the other Comparison between *Kepler*
 ' and *Ptolemee*, I question not but all
 ' that can judge, will be fully convinced
 ' that the Hypothesis of Eccentrics, and
 ' Epicycles introduced by the Ancients
 ' only

(q) P. 57.

only to represent the Motions, and that but couresly too, with the Opinion of *Ptolemy* himself therton, that the Natural Motions were otherwise performed; ought not to be valued against that elegant Theory of the Planetary Motions, first invented by the acute Diligence of *Kepler*, and now lately demonstrated by that excellent Geometer *Mr. Newton*, viz. That all the Planets move in Elliptic Orbs about the Sun, at whose Center, being placed in one Focus of the Ellipse, they describe Equal Area's in Equal Times. This, as it is the necessary Result of the Laws of Motion and Gravity, is also found rigorously to answer to all that is observed in the Motions; so that the Moderns may, with as much Reason as in any other Science whatsoever, value themselves on their having Improved, I had almost said Perfected, this of *Astronomy*.

Optical Instruments have been so serviceable in the Advancement of *Astronomy*, that the Sciences which demonstrate their wonderful Properties ought next to be considered. Here also I must own my Obligation to *Mr. Halley*, for this following Account of what the Ancients have done in them, and how much they have been out-done by Modern Mathematicians:

I suppose there are few so thorough-paced Factors of Antiquity, as to brag much of their Skill, either in *Optics* or *Diotrics*. Their Want of *Optics* appears in their want of Authors treating thereon; and yet much better in their want of *Ordinance* (as it is called) in their Paintings, and *Basse Reliefs*, as has been already said in its proper place. And as to *Diotrics*, though some of the Ancients mention *Refraction*, as a natural Effect of *Transparent Media*; yet *Des Cartes* was the first who, in this Age, has discovered the Laws of *Refraction*, and brought *Diotrics* to a Science. And the Invention of *Telescopes* and *Microscopes*, which must be wholly allowed to this Century, has received no small Improvements from the Study and Charge of Sir *Paul Neile*, and some other Members of *Gresham*. And these are such Instruments of Real Knowledge, that though we will allow the Ancients to have done all that great Geni, with due Application, could arrive at; yet, for want of them, their Philosophical Argumentation could not come up to the present Pitch; not being able to fathom the boundless Depths of the Heavens, nor to unravel the *Mysteries* of Nature, without the Assistance of the Glasses we are now possessed of.

CHAP. XXV.

Of Ancient and Modern Music.

SIR William Temple having assured us, (r) that it is agreed by the Learned, (r) P. 45. that the Science of Music, so admired by the Ancients, is wholly lost in the World: And that what we have now, is made up of certain Notes that fell into the Fancy of a poor Friar, in chanting his Martins: it may seem improper to speak of Music here, which ought rather to have been ranked amongst those Sciences wherein the Moderns have, upon a strict Enquiry, been found to have been out-done by the Ancients. I have chosen, however, to speak of it in this Place, for these following Reasons.

(1.) That whereas all Modern Mathematicians have paid a mighty Deference to the Ancients, and have not only used the Names of Archimedes, Apollonius, Diophantus, and the other Ancient Mathematicians with great Respect; but have also acknowledged, that what further Advancements have since been made, are, in a

manner, wholly owing to the first Rudiments, formerly taught: Modern Musicians have rarely made use of the Writings of *Aristoxenus*, *Ptolemee*, and the rest of the Ancient Masters in that Art; and, of those that have studied them, very few, unless their Editors, have confessed that they could understand them; and others have laid them aside, as useless for their Purpose: so that it is very probable, many excellent Composers have scarce ever heard of their Names.

(2.) *Music* has still, and always will have very lasting Charms. Wherefore, since the Moderns have used their utmost Diligence to improve whatsoever was improvable in the Writings of all sorts of Ancient Authors, upon other equally difficult and very often not so delightful Subjects, one can hardly imagine but that the World would, long ere now, have heard something more demonstrably proved of the Comparative Perfection of Ancient *Music*, with large Harangues in the Commendation of the respective Inventors, if their Memory had been preserved, than barely an Account of the fabulous Stories of *Orpheus* or *Amphion*, which either have

no Foundation at all, or as *Horace* of old understood them (3), are allegorically to be interpreted of their reducing a Wild and Salvage People into Order and Regularity. But this is not urged against Sir *William Temple*, who is not convinced of the Extent of Modern Industry, Sagacity and Curiosity; though to other Admirers of Ancient *Music*, who, upon Hearsay, believe it to be more Perfect than the Modern, and yet are, for other Reasons, sufficiently convinced of the unwearied Diligence, and answerable Success of the Modern Learned, in retrieving and improving other Parts of Ancient Knowledge, it will not appear inconsiderable.

(3.) *Music* is a *Physico-Mathematical* Science, built upon fixed Rules, and stated Proportions; which, one would think, might have been as well improved upon the old Foundations, as upon new ones; since the Grounds of *Music* have always been the same: And *Guido's Scale*, as *Dr. Wallis* assures us, is the same for Substance with the *Diagramma Veterum*.

(4.) The Ancients had not, in the Opinion of several who are Judges of the Matter, so many Gradations of Half-Notes and

(1) *Silvestres homines, sacer interpretisque Deorum,
Cadibus & vultu sedo deterruit Orpheus:
Diffus ob hoc lenire Tigres,
rabidisque Leones.
Diffus & Amphion, Thebana conditor arcis,
Saxa movere sono Testudinis, & prece blandâ,
Ducere quo vellet.*

Art. Poet.

and Quarter-Notes between the Whole ones, as are now used; which must of necessity introduce an unspeakable Variety into Modern *Musick*, more than could formerly be had: Because it is in Notes, as it is in Numbers; the more there are of them, the more variously they may be combined together.

(5.) Excessive Commendations can signify nothing here; because every Man gives the highest Applauses to the Perfectest thing he ever saw or heard, of any kind. And if he is not capable of Inventing in any particular Art himself, he can form no clear Idea of it, beyond what himself was then affected with, when he first heard those discourse of it, who pretended to be Judges of every thing relating to it.

(6.) It is very probable, that the Ancient *Musick* had all that which still most affects common Hearers. The generality of Auditors are moved with an excellent Voice, are pleased when Time is exactly kept, and love to hear an Instrument played true to a fine Voice, when the one does not so far drown the other, but that they can readily understand what is sung, and can, without previous Skill, perceive that the one exactly answers the other throughout; and their Passions will be

be effectually moved with sprightly or
luscious Compositions: In all which
Things the Ancients, probably, were very
perfect. To such Men, many of our
Modern Compositions, where several Parts
are sung or played at the same time, would
seem confused, intricate and unpleasant:
Though in those Cases, the greater this
seeming Confusion is, the more Pleasure
does the Skillful Hearer take, in unravel-
ling every several Part, and in observing
how artfully those seemingly disagreeing
Tones join, like true cut Tallies, one
within another, to make up that united
Concord, which very often gives little
Satisfaction to common Ears; though in
such sort of Compositions it is, that the
Excellency of Modern Music chiefly con-
sists. For, in making a Judgment of
Music, it is much the same thing as it is in
making a Judgment of Pictures. A great
Judge in Painting, does not gaze upon
an exquisite Piece, so much to raise his
Passions, as to inform his Judgment, as
to approve, or to find fault: His Eye runs
over every Part, to find out every Ex-
cellency; and his Pleasure lies in the
Reflex Act of his Mind, when he knows
that he can judiciously tell where every
Beauty lies, or where the Defects are
discernible: Which an ordinary Spectator
would

would never find out. The chiefest thing which this Man minds, is the Story: and if that is lively represented, if the Figures do not laugh when they should weep, or weep when they should appear pleased, he is satisfied, if there are no obvious Faults committed any where else: And thus, perhaps, equally well, if the Piece be drawn by *Raphaël*, as by an ordinary Master, who is just able to make things look like Life. So likewise in *Music*. He that hears a *numerous* Song, set to a very moving Tune, exquisitely sung to a sweet Instrument, will find his Passions raised, whilst his Understanding, possibly may have little or no share in the Business. He scarce knows, perhaps, the Names of the Notes, and so can be affected only with an Harmony, of which he can render no Account. To this Man, what is intricate, appears confused: and therefore he can make no Judgment of the true Excellency of those Things, which seem *padding* to him only, for want of Skill in *Music*. Whereas, on the contrary, the Skill or Ignorance of the Composer, serve rather to entertain the Understanding, than to gratify the Passions of a skilful Master, whose Passions are then the most thoroughly raised, when his Understanding receives the greatest Satisfaction.

(7.) It will be difficult to form a just Idea of the Pleasure which the Ancient Music afforded, unless one reflects upon the confessedly unimitable Sweetness of the Ancient Poetry, the Greek especially; which, when sung by clear and sweet Voices, in such a manner, as that the Hearer never lost a Syllable, could scarce fail of producing those Emotions of Soul which the Poet intended to raise. And, indeed, the great End of Music, which is to please the Audience, was anciently, perhaps, better answered than now; though a Modern Master would then have been dissatisfied, because such Concerts as the Ancient Symphonies properly were, in which several Instruments, and perhaps Voices, play'd and sung the same Part together, cannot discover the Extent and Perfection of the Art, which here only is to be considered, so much as the Compositions of our Modern Operas.

From all this it may, perhaps, be not unreasonable to conclude, that though (1) those Charms of Music, by which Men (1) P. 45. and Beasts, Fishes, Fowls and Serpents, were so frequently enchanted, and their very Natures changed, be really and irrecoverably lost, if ever they were had; yet the Art of Music, that is to say, of

of Singing, and Playing upon Harmonious Instruments, is, in it self, much a perfecter thing, though perhaps not much pleasanter to an unskilful Audience, than it ever was amongst the Ancient Greeks and Romans.

C H A P. XXVI

Of Ancient and Modern Physic and Surgery.

AFTER these *Mathematical* Sciences, it is convenient to go to those which are more properly *Physical*, and in our Language alone peculiarly so called. What these want in Certainty, they make up in Usefulness: For, if Life and Health be the greatest good Things which we can enjoy here, a Conjectural Knowledge, that may but sometimes give us Relief when those are in danger, is much more valuable than a certain Knowledge of other Things, which can only employ the Understanding, or furnish us with such Conveniencies as may be spared; since we see that several Nations which never had them, lived happily, and did great Things in the World.

Before

Before I begin my Comparison between *Ancient and Modern Skill in Physic*, it may be necessary to state the Difference between an *Empiric* and a *Rational Physician*; and to enquire how far a *Rational Physician* may reason right, as to what relates to the Curing of his Patient's Distemper, though his general Hypotheses be wrong, and his Theories, in themselves consider'd, insufficient. An *Empiric* is properly he who, without considering the Constitution of his Patient, the Symptoms of his Disease, or those Circumstances of his Case which arise from Outward Accidents, administers such *Physic* as has formerly done good to some Body else that was tormented with an Illness which was call'd by the same Name with this that his Patient now labours under. A *Rational Physician* is he who critically enquires into the Constitution, and peculiar Accidents of Life, of the Person to whom he is to administer; who weighs all the known Virtues of the Medicines which may be thought proper to the Case in hand; who balances all the Symptoms, and, from past Observations, finds which have been fatal, and which safe; which arise from Outward Accidents, and which from the Disease it self; and who thence collects which ought soonest to be removed,

moved, and which may be neglected, and thereupon prescribes accordingly.

Now it is evident, that such a Man's Prescriptions may be very valuable, because they are founded upon repeated Observations of the *Phænomena* of Diseases. And he may form Secondary Theories, which, like *Ptolemee's Eccentrics* and *Epi-cycles*, shall be good Guides to Practice; not by giving a certain Insight into the first Causes, and several Steps, by which the Disease first began, and was afterwards carried on; but by enabling the Physician to make lucky Conjectures at proper Courses, and fit Medicines, whereby to relieve or cure his Patient. And herein he may be equally successful, whether he resolves every thing into Hot or Cold, Moist or Dry; into Acids, or *Alkali's*; into Salt, Sulphur, or *Mercury*; or into any thing else. He does not know, for Instance, that Spittle, Bile, and the Pancreatic Juice, are the main Instruments of Digestion; yet he sees that his Patient digests his Meat with great Difficulty. He is sure that, as long as that lasts, the sick Man cannot have a good Habit of Body: He finds that the Distemper arises sometimes, though not always, from a Visible Cause; and he has tried the Goodness of such and such Medicines, in

seemingly

seemingly parallel Cases. He may be able therefore to give very excellent Advice, though he cannot, perhaps, dive into the Original and Causes of the Distemper so well as another Man; who having greater Anatomical Helps, and being accustomed to reason upon more certain Physiological Principles, has made a strict Enquiry into that particular Case. And so by consequence, tho' he cannot be said to know so much of the Nature of the Disease as that other Man; yet, perhaps, their Method of Practice, notwithstanding the great Disparity of each others Knowledge, shall be, in the main, the same.

Though all this seems certain, yet, in the Argument before us, it is not an easie thing to state the Question so equally, as to satisfy all contending Sides. He that looks into the Writings of the generality of the *Rational Physicians*, as they called themselves by way of Eminence; that is to say, of those who about an Hundred Years ago, set up *Hippocrates* and *Galen*, for the Parents and Perfecters of Medical Knowledge, will find, throughout all their Writings, great Contempt of every thing that is not plainly deducible from those Texts. On the other hand, If he dips into the Books of the Chymical Philosophers, he will meet with equal Scorn

of those Books and Methods, which they, in Derision, have called *Galenical*. And yet it is evident, that Practising Physicians of both Parties, have often wrought extraordinary Cures by their own Methods. So that there seems to have been equal Injustice on all hands, in excluding all Methods of Cure not built upon their own Principles. Here therefore, without being positive in a Dispute, about which the Parties concerned are not themselves agreed, I shall only offer these few Things: (1.) That if the Greatness of any one particular Genius were all that was to be look'd after, *Hippocrates* alone seems to have been the Man, whose Assertions in the Practical Part of Physic might be blindly received: For He, without the Help of any great Assistances, that we know of, did that, which, if it were still to do, would seem sufficient to employ the united Force of more than one Age. He was scrupulously Exact in Distinguishing Diseases, in Observing the proper Symptoms of each, and taking Notice of their Duration, thereby to make a Judgment how far they might be esteemed dangerous, and how far safe. Herein his particular Excellency seems to have lain; and this, in the Order of Knowledge, is the first thing that a Rational Physician

ought to make himself Master of. Which is a sure Argument, that *Hippocrates* thoroughly understood what things were necessary for him to study with the greatest Care, in order to make his Writings always useful to Posterity. (2.) That, in the Opinion of the ablest Judges, the *Natural History of Diseases* was as perfectly known, and they were as accurately distinguished by the Ancients, as ever they have been since; and consequently, that the Knowledge of the *Appearances*, or *Diagnosicks* (as they call them) of every Distemper common to us and them, is owing to, at least may be found in the Writings of the Ancients; for this they appeal to the Writings of *Arctæus*, and *Celsus A Cornelianus*, whose Descriptions of the Diseases they treat of, are in a manner perfect. The Fragments of *Hierophilus*, and some other ancient Physicians preserved in *Celsus A Cornelianus*, shew this not to have been peculiar to him, but common with the other great Men of Antiquity. (3.) That, setting aside Chymical Remedies, and some few Drugs brought to us out of the *West Indies*, the Body of the *Materia Medica* now in Use, is owing to the Ancients, who applied their Remedies with as great Skill and Judgment as any Modern Physicians whatsoever. But yet, (4.) Though

we should allow the Ancient Methods of Practice to have been as perfect, nay, perfecter than those now in use, which some great Men have eagerly contended for; yet it does not follow, that the whole Compass of their Profession was so well understood by the Ancients as it is now; because it is absolutely impossible to form just Theories of all Diseases, so as to lay down the perfectest Methods of Cure possible, which shall be adapted to all Persons, in all Circumstances, till Anatomy and Physiology are perfectly known; and by consequence, later Theories will always be more estimable, as they are raised upon newer Discoveries in Anatomy and Physiology: So that we may be sure no Ancient Theories can be so excellent, as some of those which have been devised by Modern Philosophers. (5) That if the Addition of every new Medicine be an useful Accession to the Body of Physic, then a new Method of Preparing known Medicines, of making those things profitable and noble Remedies, which before were dreaded as Poysons, or lud by as useless; and of trying such Experiments upon Bodies yet unexamined, as will soon and certainly discover some of their most principal Virtues, must be of unspeakable Advantage, and make the Knowledge of those

those who possess such a Method justly more valuable than that of those who want it. But this relates more particularly to *Chymistry*, of which enough has been said already. (66) That of the Practice of proper Judges be a reasonable Prejudice for or against anything, then this Science has received vast Improvements of late Years. For now the generality of Physicians acquiesce in Modern Theories, and, which in the present Dispute is almost, advance new ones upon Anatomical and Physical Principles, pursuant to those Discoveries which have been lately made. In their Practice, they mix *Galenical* and *Chymical* Medicines together. They own, that *Galenical* Ways of Preparing Drugs, anciently made use of in the Practice of *Physic*, are, in many Cases, not so valuable as *Chymical* ones. In short, though they pay a due Respect to the Writings of the Ancients, and in those things where they find by their own Experience that the Ancient Observations hold, follow their Directions; yet their constant Language, and as constant Practice, whenever one opposes Ancient Authorities to them, is, *That the Ancients did very well for their Time; but that Experience, and further Light, has taught them better Things.* This, I must needs

needs own, has very great Weight with me, who am apt, *ut iteris paritibus*, to believe every Man in his own Way; Physicians especially, because their Science is entirely got by a long Series of repeated Experiments and Observations; So that it seems to be almost impossible, but that in all such Cases, where Men have the Assistance of former Light, and where the Subject upon which they employ their Pains, wanted a great deal of that Perfection, which those that study it have an Idea of, as still wanting, and can only be attained by a longer Experience, successive Ages must make great Additions to the former Stock. (74) That though the noble Discoveries of these latter Ages might possibly be found in *Hippocrates, Aristotle and Galen*; yet, since no Interpreters could ever find them there, till they were actually discovered anew by Modern Physicians, who followed Nature only as their Guide, these late Discoverers have as just Right to the Glory due to such Discoveries, as the Ancients could possibly have: They both copied after the same Original; they both decyphered the same Characters, that before were unintelligible; not by reading Books, but by trying Experiments, and making Observations. And therefore, *Vander Linden,*

Almeloveen,

Almeloveen, and the rest of the Bigots for the Ancients, deal very unjustly, when they cry out, upon the Sight of any New Discovery, This *Hippocrates* knew; This *Aristotle* taught. Could these Men have made these Discoveries by studying those Ancient Authors, without the Assistance of *Dr. Harvey*, *Asellius*, *Pecquet*, *Malpighius*, or the rest. This would hold, in case the Circulation of the Blood, the *Glyst Vessels*, *Lympheducts*, and the other great Discoveries in Anatomy, had really been in the Ancients. That they are not, I hope I have proved already. To which I shall only add, That former Commentators wanted neither *Greek*, nor Skill; and had such Things been in their Writings, they would infallibly have found them there.

It is easie now to tell what Acquisitions have been made since *Galen's* Days. When *Hippocrates* lived, Anatomy was a rude, imperfect Thing: It has since been growing, and the Theories of all Diseases have been proportionably more compleat. *Chymistry* has been introduced into *Physic*; thereby the *Materia Medica* has been enlarged by some as noble Medicines as any the Ancients were acquainted with; the Nauseousness of many Medicines has been removed; and they have been made less clogging,

clogging, and more efficacious, since they may be taken in lesser Quantities, and in more pleasant Vehicles; to as good, if not better purpose than before. *But* have been unspeakably enlarged; and thereby also the Dispensatories have been stocked with some excellent Remedies, that the Old World knew nothing of. If these Particulars be rightly stated, as they seem to be, they will go very far to decide the Question: And we shall leave it, without determining any thing positively about it. So much for that part of *Medicine* which in our Language is peculiarly call'd *Physic*. *Surgery* comes next to be considered; which though at present it be looked upon as inferior to *Physic*, yet it was much the ancientest, and is still the certainest part of *Medicine*. For here the Eye directs the *Surgeon* how he shall proceed, and if he knows but the Virtue of his Medicines, and how to apply them, he can generally speaking, tell whether his Patient be curable or not. Anciently this was only a Branch of the *Physician's* Work; and the Old *Physicians* in the Heroical Times, *Æsculapius*, *Chiron*, *Machaon*, and the rest, were little more than *Surgeons*, that could apply a Plaister, and cure a Green Wound. Nay, after Learning had emboldened Men to reason

upon

upon the Causes of Diseases, whose Original was not visible to the naked Eye; and to try whether Inward Remedies would not cure them, Surgery was constantly treated of by Physicians, as a Part of their Profession. Celsus alone will convince every Man of the Truth of this Proposition.

But how they treated of it, I durst not adventure to assert; tho' the Public will thank me for leaving it untouch'd, since that eminently Learned Surgeon, Mr. Charles Bernard, who is so great an Honour to his Profession, has done me the favour to communicate this following Paper, which I shall subjoin in his own words:

If we enquire into the Improvements which have been made by the Moderns in Surgery, we shall be forced to confess, that we have so little reason to value our selves beyond the Antients, or to be tempted to contemn them, as the fashion is among those who know little, and have read nothing, that we cannot give stronger or more convincing Proofs of our own Ignorance, as well as our Pride. I do not pretend that the Moderns have not at all contributed towards the Improvement of Surgery; that were both absurd and injurious, and would

clogging, and more efficacious, since they may be taken in lesser Quantities, and in more pleasant Vehicles, to as good, if not better purpose than before. But *Antients* have been unspeakably enlarged, and thereby also the *Dispensatories* have been stocked with some excellent Remedies, that the Old World knew nothing of. If these Particulars be rightly stated, as they seem to be, they will go very far to decide the Question: And so I shall leave it, without determining any thing positively about it. So much for that part of *Medicine* which in our Language is peculiarly call'd *Physic*. *Surgery* comes next to be considered; which though at present it be looked upon as inferior to *Physic*, yet it was much the ancientest, and is still the certainest part of *Medicine*. For here the Eye directs the *Surgeon* how he shall proceed, and if he knows but the Virtue of his Medicines, and how to apply them, he can generally speaking, tell whether his Patient be curable or not. Anciently this was only a Branch of the *Physicians* Work; and the Old *Physicians* in the Heroical Times, *Esculapius*, *Chiron*, *Machaon*, and the rest, were little more than *Surgeons*, that could apply a Plaster, and cure a Green Wound. Nay, after Learning had emboldened Men to reason

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'would argue as much Folly as that which
 'I am reproaching : But that which I am
 'contesting for, is, That it consists ra-
 'ther in refining and dressing up the In-
 'ventions of the Ancients, and setting
 'them in a better light, than in adding
 'many important ones of our own. Whe-
 'ther it be, that the Art of Healing Ex-
 'ternal Hurts, being principally the Sub-
 'ject of our Senses, was earlier studied,
 'and therefore, capable of being sooner
 'brought to a greater degree of Perfe-
 'ction, than the other Branch of Medi-
 'cine; or, that the majority of the most
 'Professors having been, for some Ages, illi-
 'terate and Empirical, it hath not been
 'advanc'd and cultivated so as it might
 'have been, had they been better qua-
 'lified than they generally were, and do
 'yet, for the greatest part continue to
 'be. For a Testimony of which, that
 'exceeding Paucity of good Writers which
 'occur in Surgery, when compar'd with
 'those in most of the other learned Arts
 'and Sciences, is, in my Opinion suffi-
 'cient; and yet, were they fewer, 'twould,
 'in the Judgment of these *Sciolts*, be no
 'great detriment to the Art. For the
 'Folly of which Assertion, the best Ex-
 'cuse that can be made, seems to be, that
 'because some Methods of proceeding
 'both

both in *Physic* and *Surgery*, which are incommunicable, to which every Man must be directed by his own Judgment, and Natural Sagacity, not being to be found in those Authors whom these opinionated Practitioners have had the luck to consult, they are led immediately to despise all Reading, as useless and unattractive; especially that of the Ancients, who do not generally, I confess, write to Novitiates and Fools, or to those who will be always such.

But whoever hath been conversant in their Writings, and hath the Opportunity and Capacity of Comparing and Judging from his own Experience, will readily confess, that one thing which does not a little recommend the Reading of them beyond most of the Moderns, is, that they are more accurate in describing the *Pathognomonics*, and more just and nice in distinguishing the Species of Tumors and Ulcers, than our more refined Moderns are.

If this Age hath part'd away any rude and superfluous Methods of Practice, as it must be confessed they have, it cannot be demonstrated that they were all deriv'd from the Ancients, but were in a great measure introduc'd by ignorant and barbarous Professors of a much later date.

[There

There is no question but that the principal Improvements which have in these latter Ages been made in Surgery, are owing chiefly to the Discoveries which have been made in Anatomy, by which we are better enabled to solve many of those Phenomena which were before inexplicable, or explained amiss in the most important part, in the mean while (I mean the Art of Healing, to which all the others ought to be subservient) remaining very little better than the Ancients left it.

As an uncontestable Proof of what I say, I appeal to all those Bodies of Surgery which have been hitherto published by the most Learned and Celebrated of the Moderns, being all manifestly Transcripts from one another, and the best of them from the Ancients. But this may indeed be said in Defence of the Moderns in this Particular, That even Transcribing is not their Invention, tho' it be their Practice; for *Aetius* and *Aetiana* have borrow'd not a little of what they have from *Galen*; and *Marcellus Empiricus* more grossly from *Scribonius Largus*, without so much as remembering his Name among the rest of those Authors to whom he was less beholden.

There

Among

Among all the Systematical Writers, I think there are very few who refuse the Preference to *Hieron Fabricius* *ab Aquapendente*, as a Person of unquestioned Learning and Judgment; and yet is not he ashamed to let his Readers know, that *Celsus* among the *Latins* (whom he tells us, is *Mirabilis in Omnibus*, and advises, in *Horace's* words, *Nachurnū versare manu, versare diurnū*), *Paulus Aegineta* among the *Greeks*, and *Alhucasis* among the *Arabians* (whom I am unwilling to place among the *Moderns*, being in the number of those whom our *Modern Judges* reject, either because they never read him, or because he had the misfortune to live *DC Years* since) are the *Triumvirate* to whom he principally stands indebted, for the Assistance he received from them, in composing his excellent Book.

But how many Operations are there now in use, which were unknown to the *Ancients*? I fear, that upon a due Enquiry, there would be more useful ones found to be omitted or discontinued, than to have been invented by us. But to descend a little to Particulars, that we may, without Prejudice or Partiality, be enabled to determine whether the *Ancients* are indeed so contemptible,

'remible, and their Writings so useful,
 'as some would represent them. Cutting
 'for the Stone (to begin with that) was
 'unquestionably theirs, and the man-
 'ner accurately described by *Celsus* and
 'others; and yet, that no Person or Age
 'may be defrauded of the Glory they de-
 'serve, where we can do them right, we
 'must confess, that that way of perform-
 'ing it, which in most Cases is preservable,
 'and in some only practicable, which by
 'Authors is styl'd *Magnus Apparatus*, the
 'High Operation, or Cutting upon the
 'Staff, was invented by one *Johannes de*
 '*Romanis* of *Cremona*, who flourisht at
 '*Rome*, about the Year *MDXX*. The
 'Manner of the Operation, and the In-
 'struments necessary, were first described
 'and publish'd by his Scholar *Marianus*
 '*Sanctus Barolitanus*, at *Venice*, in *MDXXV*.
 'The Use of the *Modiolus*, in Opening the
 'Skull, was likewise theirs; our Country-
 'man *Woodall* only mending the Instru-
 'ment, by making that taper, which was
 'before cylindrical, and for that reason
 'not altogether so secure. The *Ale*, or
 'Wings, being the Invention of that Great
 'Man *Aquapendens*, to whom we stand
 'obliged for many other useful Instru-
 'ments. The *Paracentesis*, in all its kinds,
 'is theirs. *Barbette*, indeed, invented an

Instru-

Instrument which is sometimes more commodiously made use of than the Ancient Methods are. *Laryngotomy*, or the Opening of the Wind-Pipe in a Quinsey, was practis'd by them; an Operation secure and necessary, however, at this day so disus'd, that it is almost become obsolete, either through the Timidity of the Patient, or Relations, or the Backwardness or Ignorance of the Physician or Surgeon; and though *Aretæus*, *P. Aegineta*, and *Cælius Aurelianus*, seem, from the Authority of *Antyllus*, to discourse doubtfully of it, yet the greatest part of the Ancients, both Greeks and Arabians, advise it; and *Galen* in particular, from Reason and Experience, as well as from the Authority of *Asclepiades*, justly recommends it as the last Refuge in a Quinsey. *Cutting for the Hernia Intestinalis*, with the true Distinctions and Cures of all the other Species, are accurately described by them. They taught us the Cure of the *Pterygium* and *Cataract*; they describ'd and distinguish'd all the Diseases of the Eyes, (which were not then, as now, to the reproach of the Age they are, almost solely in the Hands of Old Women and Mountebanks) as justly as any of our Modern Oculists, who, indeed, do little more than

'than transcribe from them: Opening the
 'Artery, and the Jugular Vein, (pretended
 'to be revived here in England) was no
 'more first attempted by the Moderns,
 'than making *Ligature* in an *Aneurysm*,
 'which tho' an Operation of no mighty
 'difficulty, was certainly not understood,
 'very lately, by *Fred. Ruysch*, a consi-
 'derable Dutch Anatomist, and Professor
 'of that and Surgery at *Amsterdam*, [as
 'may be seen in his *Observationes Ana-*
 '*tomicae Chirurgicae*, Obs. 2. printed in
 '*Quarto*, at *Amstel* MDCXCI.] The Exci-
 'pation of the Tonsils, or Uvula, is not
 'our Invention; though, indeed, the re-
 'moval of the former by *Potential Ca-*
 '*terias*, which we sometimes use, when
 'the Patient will not admit Excision, or
 'Fire, seems neither to have been practis'd
 'nor known to the Ancients. The man-
 'ner of treating the *Fistula Lacrymalis*,
 '(a nice and difficult Cure, very often,)
 'which we continue at this day, is no
 'other than what was taught by them,
 'only the Use of the *Canula* for the
 'Cautery, seems owing to *Fabst. ad Aqua-*
 '*pendente*. As for the *Actual Cautery*,
 'no inconsiderable, however terrible a
 'Branch of Surgery it may seem, though
 '*Coscius*, *Ficinus* and *Struvinus* have written
 'so amply concerning it, yet from one
 'single

single Aphorism 'tis demonstrable, that *Hippocrates* knew its true Use as well as any that have since succeeded him; not to mention how frequent it is in the Writings of all the rest of the Ancients, and us'd in many Cases, (I do not doubt but with admirable success) wherein it is wholly neglected, or not understood by us. The Cure of the *Varices*, by Incision, scarce talk'd of in our days, seems to have been familiarly practis'd among the Ancients, as is manifest from *Celsus*, and *Paulus Aegineta*; though so painful an Operation, that, as *Tully* [2. *Tuscul.*] and *Plutarch* tell us, *Marius* was the first who in one Leg underwent it, standing, and without being bound, though he could not be prevail'd upon to purchase with so much Torture a Cure in the other: And though *Pliny* tells us, that he was *unus Hominum*, the single Instance; yet *Tully* assures us, that by his Example, there were others that sustain'd it with equal Resolution and Fortitude. And whoever is conversant with those obstinate Varicous Ulcers which we frequently meet with, will confess, that for the effecting a Cure, 'tis absolutely necessary, however painful and superfluous an Operation some may esteem it. The Ancients mention

the *Vari* and *Valgi*, and prescribe us a Method of Cure; but the manner of their Reduction by the Instruments now in use they knew not, which were the Invention of *Fabricius ab Aquapendente*; as was also that for Extraction of the *Polypos*, which nevertheless the Ancients cur'd as frequently, though not so com- modiously as our selves. But the *Polypos* of the *Ear* (a Disease indeed which occurs not so often as the preceding) seems so little known to the Moderns, that the very Mention of any such Disease is rarely to be met with in any of their Writings, yet the Cure of it is not omitted by the Ancients. They were perfectly acquainted and furnish'd with convenient Instruments for the Reduc- tion of all the Species of *Fractures* and *Luxations*, and the Methods of treating them afterwards; together with all the kinds of *Sutures* at this day in use among us, and some too that are now lost, at least so uncertain, that some very learned Men have thought they employed not their time amiss, in endeavouring to determine what they were, and to re- cover their Use. And though some have contended, that *Issues* were un- known to them, the contrary is evident, from *Celsus*, and *Caelius Aurelianus*, who

we must acknowledge, that the placing and continuing them as now we do, appears not to have been in use among them. Nor is the *Seton* so extremely Modern, but that *Lanfrancus*, who liv'd CCCC Years since, directs its Use, and describes the manner of Making, (yet mentions it not as an Invention of his time,) though, indeed, till *Hildanus's* his days, it seems to have been always made with the Actual Cautery.

There is no doubt but the *Tægro-porona*, or Cutting the Infant out of the Mother, to preserve both, commonly call'd *Partus Cæsareus*, (not often, if at all practis'd among us, though reviv'd by some of our Neighbours with a success which ought to provoke the Emulation of our Professors here) is owing purely to the Felicity of the Moderns of the last Century. For, not to enter into the Controversie, whether *Pliny*, *Novius* or *Isidore* were in the right, in asserting, that the First of the *Cæsars* was denominated from his manner of Birth; or *Probus* and *Festus*, in affirming, that they were the *Cæsars*; whereas the *Cæsars* were only so called, from their Hair: Most certain it is, that neither Side pretend the Operation to have been done *Matre Superstite*: Nor

the *Fur* and *Valgi*, and prescribe us a Method of Cure; but the manner of their Reduction by the Instruments now in use they knew not, which were the Invention of *Fabricius ab Aquapendente*; as was also that for *Extraction* of the *Polypos*, which nevertheless the Ancients cur'd as frequently, though not so com- modiously as our selves. But the *Polypos* of the *Ear* (a Disease indeed which occurs not so often as the preceding) seems so little known to the Moderns, that the very Mention of any such Disease is rarely to be met with in any of their Writings, yet the Cure of it is not omitted by the Ancients. They were perfectly acquainted and furnish'd with convenient Instruments for the Reduc- tion of all the Species of *Fractures* and *Luxations*, and the Methods of treating them afterwards; together with all the kinds of *Sutures* at this day in use among us, and some too that are now lost, at least so uncertain, that some very learned Men have thought they employed not their time amiss, in endeavouring to determine what they were, and to re- cover their Use. And though some have contended, that *Issues* were un- known to them, the contrary is evident, from *Celsus*, and *Caelius Aurelianus*, who

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is there any Evidence, that cutting the *Fœtus* out of the Womb, and preserving the Mother, was ever propos'd or thought of by the Ancients, whether *Greek, Latin* or *Arabian*; both the Story, and the Reason of the Name, being to be found only in the Historians and Grammarians. Who it was that first propos'd or practis'd it, I confess, I am not able to determine: For *Fr. Rossetus*, who first wrote solemnly and expressly, or indeed at all, concerning it, produces several Examples of other Men's Experience and Success, before ever he attempted it himself.

As for those Operations which the *Greeks* call'd *Κοιλιόματα*, or *Curtorum Chirurgia*, they amounted to no more than cutting the Hair-Lip, or the like, for that they knew and practis'd; and therefore it becomes us to do right to the Age whose it was, for the Discovery of that which *Gaspar Taliacotius* properly so calls, and which himself brought to Perfection; and (whatever Scruples some who have not examin'd the History, may entertain concerning either the Truth or Possibility of the Fact) practis'd with wonderful Dexterity and Success, as may be prov'd from Authorities not to be contested. So that it is a most surprising thing to

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consider, that few or none should have since attempted to imitate so worthy and excellent a Pattern, especially in an Age wherein so many deplorable and scandalous Objects do every day seem either to beg or command our Assistance. But I do not assert him to have been the first Inventor, because it is what I find mention'd, though imperfectly, by *Alex. Benedictus*, before *Taliacotius* was born; and afterwards, by *Vesalius*, in his *Chirurgia Magna*, if at least that mean Piece be his, as we have it publish'd by *Borgarutius*, which *Fabr. Hildanus* justly questions. There is likewise an Epistle quoted by *Steph. Gourmelenus*, in his *Ars Chirurgica*, written from one *Calentius* to his Friend *Orpianus*, (who, it seems, had the misfortune to want a Nose,) giving him an Account, that there was one *Branca*, a *Sicilian*, *qui didicit nares inferere*, which *Calentius* himself had seen perform'd, and therefore invites him to come, with this Encouragement, That he might be sure to return with a Nose of what size he pleas'd. Who this *Orpianus* was, is not material to enquire; nor can I, I confess, say much of this *Branca*, (or *Branca*, as *Taliacotius* calls him, who seems to know no more of Him or his History, than what he tran-

' scrib'd from *Gourmeleenus*; and *Gourme-*
 ' *leenus* himself, no more than is express'd
 ' in this Epistle of *Calentius*, which af-
 ' fords but little light into the History;)
 ' though it is very probable that he was
 ' the same Person whom *Ambr. Parey* men-
 ' tions to have practis'd this way of
 ' Inoculating Noses some Years before his
 ' time in *Italy*, and gives an Instance of
 ' a Cadet of the Family à *S. Thoano*, who
 ' being weary and asham'd of a Silver
 ' Nose, applying himself to this *Italian*,
 ' return'd with one of Flesh, to the Won-
 ' der and Satisfaction of all that knew
 ' him. As for this *Elisius Calentius*, from
 ' whom we have the first mention, that I
 ' can find, of any such Operation, he was
 ' Contemporary and Familiar with *San-*
 ' *nazarus*, and *Jov. Pontanus*, who men-
 ' tions him; as does also *Lilius Gyraldus*,
 ' in his History of the Modern Poets, and
 ' tells us, agreeably enough, that he was
 ' Poor, Amorous, and a Poet; that he was
 ' born at *Amphracta*, in *Apulia*, but liv'd
 ' generally at *Naples*. His Works were
 ' printed about MDIII; and afterwards,
 ' his Epistles, among other select ones,
 ' were publish'd by *Gilb. Cognatus*, and
 ' printed by *Oporinus*, in MDLVIII. But
 ' I must not omit, among the rest, (what
 ' indeed is so notorious, that no Man, I
 ' sup-

'suppose will deny it,) That all the sorts
'of *Amputations*, as Limbs, and Breasts, &c.
'were as familiarly practis'd among the
'Ancients, as any can pretend they are
'among us, if we had only the Authority
'of a Poet for it, *Inmedicabile vulnus*
'*cense rescindendum est.*

'The Art of *Bandage*, or *Rowling*,
'no mean or unnecessary, though neg-
'lected piece of *Surgery*, and upon which
'the *French* do so much value themselves,
'they knew so well, and had in such per-
'fection, that we have not pretended to
'add much to that excellent and useful
'Treatise which *Galen* hath expressly writ-
'ten upon that Subject. And though the
'Variety of Instruments now in use may
'seem, in some measure, to be justly chal-
'leng'd by the Moderns, every Man ad-
'ding as his own Fancy suggested, and
'the Necessity required; yet by what are
'transmitted to us by the Ancients, 'tis
'notorious, that they were neither igno-
'rant nor destitute of those which were
'most necessary; and that they had va-
'riety of others too, may, by what we
'see describ'd by *Oribasius* and others, and
'at this day made use of, more easily be
'imagin'd than prov'd, but seems highly
'probable.

As for Topical Medicines, most certain it is that we are oblig'd to them, for instructing us in the Nature and Properties of almost all those of which we do at this day form our Applications; some few excepted, the Productions of Modern Chymistry, in this or the preceding Century.

And as for general Methods of Cure, many of them have been so excellently well handled by the Ancients; (to instance only in Wounds of the Head) that several of the Moderns who have written most judiciously upon them, have been of Opinion, that they could not serve and oblige Posterity better, than by Commenting upon that admirable Book of *Hippocrates* upon the same Subject.

That which without Injury to the Ancients, or Vanity in our Selves, may be justly said, is, That the publishing Observations after that Method which some of the Moderns have done, is that wherein we must be allowed infinitely to have exceeded them; and is vastly of more Advantage to the Reader, than the perusal of tedious Systems are capable of being, two or three of which generally comprehending whatever is to be found in all the rest: But particular

Cases

Cases, when judiciously and faithfully reported, (of which too few, I fear, even of the Moderns, are guilty,) *Et prodesse solent & delectare*, are diverting and instructive at once, the Reader more effectually adding other Men's Experience to his own.

But to insist upon every Particular, and to pretend to demonstrate what hath been invented, discontinued, or lost in every Age, if it be to be done, requires a Person of greater Leisure, and infinitely more capable than my self. What I have said, is sufficient to shew, that it becomes us to speak of the Ancients with Respect and Civility at least, if it were only for this, That it was our Instruction, and the Benefit of Mankind in general, which induc'd them to take that Care, and to be at so much Expence of Time and Labour to communicate their Knowledge to the World: Not that we are implicitly to be determin'd by their Authority, or to suppose that they have not left room for succeeding Ages to Invent, and to Improve all those Parts of *Surgery* wherein they appear either to have been mistaken or deficient. For my own part, I must confess, I do entirely concur with *Thomas Bartholine*, [*Epist. Med. Cent. 3.*] who very well
under-

' understood the Advantages which the
 ' Moderns had, and was himself as soli-
 ' citous for the Improvement of Know-
 ' ledge, as inquisitive into Nature, and
 ' as happy in his Discoveries, as any of
 ' those who imagine it a part of their
 ' Wit and Breeding, to ridicule and con-
 ' temn the Ancients; *Pessimè studiis suis*
 ' *consulunt* (says he) *qui ita recentiorum*
 ' *scriptis se immergunt, ut veteres vel neg-*
 ' *ligant vel contemnant, quum plerarumque*
 ' *rerum lux ex illis pendeat*: And in ano-
 ' ther place; *Ita semper recentiorum sen-*
 ' *tentiis & opinionibus calculum adjeci, ut*
 ' *sua antiquitati reverentia servaretur, cui*
 ' *artis nostrae fundamenta debemus.*

CHAP.

C H A P. XXVII.

*Of Ancient and Modern Natural
Philosophy.*

HAVING gone through with the most
considerable Branches of *Natural*
and *Mathematical Knowledge*, I am now
to enquire into the Comparative Excel-
lency of *Ancient and Modern Books of*
Philosophy, thereby to see in which of
them Nature, and its Operations, are ex-
plained best. Here I shall first enquire
into the several *Methods of Philosophizing*;
and afterwards, into the *Intrinsic Worth*
of the *Doctrines themselves*. *Moderns*
here are taken in a very strict sence. I
shall mention none who have made any
Entries upon this noble Stage of Nature (u) (u) P. 44.
above *LXXX* Years ago, since the time
of those first *Flights of the Restorers of*
Learning, that are so exceedingly ap-
plauded by *Sir William Temple*. For *Natural*
Philosophy was the last part of Know-
ledge which was cultivated with any par-
ticular Care, upon the Revival of *Learn-*
ing; though *Natural History*, which is
a principal Ground-work, had been long
before encreasing, and a considerable Heap
of

of Materials had been collected, in order to the Work.

As for *Modern Methods of Philosophizing*, when compared with the *Ancient*, I shall only observe these following Particulars.

(1.) No Arguments are received as cogent, no Principles are allowed as current, amongst the celebrated Philosophers of the present Age, but what are in themselves intelligible; that so a Man may frame an Idea of them, of one sort or other. Matter and Motion, with their several Qualities, are only considered in Modern Solutions of Physical Problems.

- (2) P. 46. *Substantial Forms, Occult Qualities, (x), Intentional Species, Idiosyncrasies, Sympathies and Antipathies of Things*, are exploded; not because they are Terms used by Ancient Philosophers, but because they are only empty Sounds, Words whereof no Man can form a certain and determinate Idea. (2.) Forming of Sects and Parties in Philosophy, that shall take their Denominations from, and think themselves obliged to stand by the Opinions of any particular Philosophers, is, in a manner, wholly laid aside. *Des Cartes* is not more believed upon his own Word, than *Aristotle*: Matter of Fact is the only thing appealed to; and Systems are little further regarded, than as they are proper to instruct

instruct young Beginners, who must have a general Notion of the whole Work, before they can sufficiently comprehend any particular Part of it; and who must be taught to reason by the Solutions of other Men, before they can be able to give Rational Solutions of their own. In which Case, a false Hypothesis, ingeniously contrived, may now and then do the Service of a true one. (3.) *Mathematics* are joined along with *Physiology*, not only as Helps to Men's Understandings, and Quickeners of their Parts, but as absolutely necessary to the comprehending of the Oeconomy of Nature, in all her Works. (4.) The *New Philosophers*, as they are commonly called, avoid making general Conclusions, till they have collected a great Number of Experiments or Observations upon the Thing in hand; and, as new Light comes in, the old Hypotheses fall without any Noise or Stir. So that the Inferences that are now a-days made from any Enquiries into Natural Things, though perhaps they be set down in general Terms, yet are (as it were by Consent) received with this tacit Reserve, *As far as the Experiments or Observations already made, will warrant.*

How much the pursuing of these Four Things will enlarge *Natural Philosophy*, is easie

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easie to guess. I do not say, that none
 of these things were anciently minded;
 but only, that they were not then so gene-
 rally put in practice. The great Men of
 Antiquity often exprest themselves in
 unintelligible Cant: They chiefly aimed
 at being Heads of particular Sects. Few
 of their Natural Philosophers were great
 Mathematicians: And they did in general
 establish Hypotheses without a sufficient
 Fund of Experiments and Observations
 whereupon to build them. The *Corpus-
 cularian Philosophy* is in all probability the
 oldest, and its Principles are those intel-
 ligible ones I just now commended. But
 its Foundations being very large, and re-
 quiring much Time, Cost, and Patience,
 to build any great Matters upon, it soon
 fell, before it appears to have been throug-
 hly understood. For it seems evident, that
Epicurus minded little but the raising
 of a Sect, which might talk as plausibly
 as those of *Aristotle*, or *Plato*, since he
 despised all manner of Learning, even
 Mathematics themselves, and gloried in
 his having spun all his Thoughts out of
 his own Brain; a good Argument of his
 Wit indeed, but a very ordinary one of
 that Skill in Nature which *Lucretius* ex-
 tols in him, as often as he takes occasion
 to speak of him. The Ancient Physicks

look

look like a thing wholly of Ostentation and Pomp, otherwise I cannot understand why *Plato* should reprove *Eudoxus* and *Archytas*, for trying to make their Skill in Geometry useful in Matters of Civil Life, by inventing of Instruments of public Advantage; or think that those sublime Truths were debased, when the unlearned part of Mankind were made the better for them. And therefore, as *Plutarch* complains, in his *Life of Marcellus*, Mechanical Arts were despised by Geometers till *Archimedes's* Time: Now though this be particularly spoken there by *Plutarch*, of the Making of Instruments of Defence and Offence in War, yet it is equally applicable to all the Ancient Philosophy and Mathematics in general. The Old Philosophers seemed still to be afraid that the Common People should despise their Arts, if generally understood: This made them keep, for the most part, to those Studies which required few Hands and Mechanical Tools to compleat them: Which to any Man that has a right Notion of the Extent of a Natural Philosopher's Work, will appear absolutely necessary. Above all, the Ancients do not seem sufficiently to have understood the Connexion between Mathematical Proportions of Lines and Solids, in an abstracted Proposition, and in

(y) De
U.P. L.X.
c. 12, 13,
14.

in every Part of the Creation; at least in their Reasonings about the Causes of Natural Things, they did not take much Pains to shew it. When Galen was to give an Account of Vision, in his Books (y) *de Usu Partium*, because he had Occasion to use some few Geometrical Terms, as *Cone*, *Axis*, *Triangle*, and the like; he makes a long Excuse, and tells a tedious Story of a Daemon which appear'd to him, and commanded him to write what he did; and all this, left the Physicians of that Age should think he Conjur'd, and so take a Prejudice against all he said. This shews, that in Galen's Time at least, there was little Correspondence between Mathematical and Physical Sciences, and that Mankind did not believe there was so intimate a Relation between them as it is now generally known there is. Many a Man that cannot demonstrate any one single Proposition in *Euclid*, takes it now for granted, that Geometry is of infinite Use to a Philosopher; and it is believed now upon Trust, because it is become an Axiom amongst the Learned in these Matters. And if it had been so received in Galen's Time, or by those more Ancient Authors whom Galen and his Contemporaries followed, or pretended at least to follow, as their Patterns; such as *Hippocrates*,

Procrates, whom all Sides revered, *Hierophilus*, *Erasistratus*, *Asclepiades*, and several more, there would have been no need of any Excuses for what he was doing: since his Readers being accustomed to such sort of Reasonings, would either readily have understood them, or acquiesced in them as legitimate Ways of Proof. If Three or Four Mathematical Terms were so affrighting, how would those learned Discourses of *Steno* and *Croone*, concerning Muscular Motion, have moved them? How much would they have been amazed at such minute Calculations of the Motive-strength of all the Muscles in the several general sorts of Animals, as require great Skill in Geometry, even to understand them, which are made by *Borellus*, in his Discourses of *the Motion of Animals*? It is not enough, in this Case, to quote a Saying or two out of some great Man amongst the Ancients; or to tell us, that *Plato* said, long ago, *That God Geometrizes in all his Works*; as long as no Man can produce one Ancient Essay upon any Part of Physiology, where Mathematical Ratiocinations were introduced to solve those Phenomena of Natural Things, upon which it was possible to talk plausibly without their Help. At least, it is certain, That they contented themselves with general

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Theories,

(1) De
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Theories, without entering into minute Disquisitions into the several Varieties of Things, as is evident in the two Cases already alledged, of *Vision* and *Muscular Motion*.

Now as this Method of Philosophizing laid down above, is right, so it is easie to prove, that it has been carefully followed by Modern Philosophers. My Lord Bacon was the first Great Man who took much pains to convince the World that they had hitherto been in a wrong Path, and that Nature herself, rather than her Secretaries, was to be address'd to by those who were desirous to know much of her Mind. Monsieur *Des Cartes*, who came soon after, did not perfectly tread in his Steps, since he was for doing too great a part of his Work in his Closet, concluding too soon, before he had made Experiments enough; but then to a vast Genius he joined exquisite Skill in Geometry, and working upon Intelligible Principles in an Intelligible Manner, though he very often failed of one part of his End, namely, a right Explication of the *Phænomena* of Nature; yet by marrying Geometry and Physics together, he put the World in Hopes of a Masculine Off-spring in process of Time, though the first Productions should prove abortive. This was the state

state of Natural Philosophy, when those great Men who, after King Charles II^d Restoration, joined in a Body, called by that Prince himself, the *ROYAL SOCIETY*, went on with the Design; they made it their Business to set their Members a work to collect a perfect History of Nature, in order to establish thereupon a Body of Physics. What has been done towards it by the Members of that Illustrious Body, will be evident to those who consider that Boyle, Barrow, Newton, Huygens, Magpius, Leenwenhoek, Wallughby, Willis, and abundance more already named amongst the great Advancers of real Learning, have belonged to it: If it shall be thought too tedious an Undertaking, to examine all their Writings, Mr. Boyle's Works, Monsieur Le Clerc's *Physica*, any one good System of the Cartesian Philosophy, Monsieur Robauld's for Instance, or to comprehend all under one, a Book intituled, *Philosophia Ketus & Nova ad Usum Scholæ accommodata*, may be consulted, and then there will be no difficulty to determine of which Side the Verdict ought to be given; in the last Book especially it is evident how very little the Ancients did in all Parts of Natural Philosophy, and what a great Compass it at present takes, since it makes the Comparison I all along appeal to.

Thus, it seems to me to be sufficiently plain, That the Ancients Knowledge in all Matters relating to *Mathematics* and *Physics*, was incomparably inferior to that of the Moderns. These are Subjects, many of them at least, which require great Intensity of Thought, great Strength and Clearness of Imagination, even only to understand them; how much more then to invent them? The Ancient Orators, who spoke so great things in Praise of *Eloquence*, who make it so very hard a thing to be an Orator, had little or no Notion of the Difficulty of these Sciences; the *Romans* especially, who despised what they did not understand, and who did not without some Indignation learn of a People whom themselves had conquered. But if they could have conceived what a Force of Genius is required to invent such Propositions as are to be found in the Writings of their own Mathematicians, and of the Modern Geometers and Philosophers, they would soon have acknowledged that there was need of as great at least, if not greater Strength of Parts and Application to do very considerable things in these Sciences, as in their own admired *Eloquence*, which was never more artfully employed than in commending it self: The Panegyrics which they made upon
Geometry,

Geometry, were rather Marks of their Pedantry, than of their Skill; *Plato* and *Pythagoras* admired them, and therefore they did so too, out of a blind Reverence to those great Names. Otherwise, amongst those numerous Commendations which are given to *Archimedes*, some would have been spent upon the many noble Theorems which he discovered, and not almost all upon the Engines wherewith he baffled *Marcellus* at the Siege of *Syracuse*. The Proposition, *That the Superficies of a Sphere is equal to the Areas of Four of its greatest Circles*, which is one of the most wonderful Inventions that was ever found in Geometry, shews him to have been a much greater Man, than all that is said of him by the *Roman* or *Greek* Historians. Had Experimental Philosophy been anciently brought upon the Stage, had Geometry been solemnly and generally applied to the Mechanism of Nature, and not solely made use of to instruct Men in the Art of Reasoning, and even that too, not very frequently; neither, the Moderns would not have had so great Reason to boast as now they have: For these are things which come under Ocular Demonstration, which do not depend upon the Fancies of Men for their Approbation, as Oratory and Poetry often

B b ; do.

do. So that one may not only in general say, that the Ancients are out-done by the Moderns in these Matters, but also assign most of the Particulars, and determine the Proportion wherein and how far they have been exceeded; and shew the several Steps whereby this Sort of Learning has from Age to Age received Improvement; which ends Disputes and satisfies the Understanding at once.

СНАР. XXVIII

Of the Philological Learning of the Moderns

Hitherto, in the main, I please myself, that there cannot be much said against what I have asserted, though I have all along taken care not to speak too positively, where I found that it was not an easy thing to vindicate every Proposition without entering into a Controversie, which would bear plausible things on both Sides, and so might be run out into a multitude of Words, which in Matters of this kind are very tiresome. But there are other Parts of Learning still be-

hind, where the bare offering to compare the Moderns to the Ancients, may seem a Paradox; where the subject Matter is entirely ancient, and is chiefly, if not altogether contained in Books that were written before the Ancient Learning suffered much Decay.

Under this Head, *Philology* and *Divinity* may very properly be ranked. I place *Divinity* last, to avoid Repetition; because what I have to say concerning Modern *Philology*, will strengthen many things that may be urged in the Behalf of Modern *Divinity* as compared with the Ancient.

In speaking of the Extent and Excellency of the *Philological Learning* of the Moderns within these last CC Years, I would not be mis-understood. For the Question is not, whether any Modern Critic has understood *Plato* or *Aristotle*, *Homer* or *Pindar*, as well as they did themselves, or even so well as they were understood by the Age in which they wrote, for that were ridiculous; but whether Modern Industry may not have been able to discover a great many Mistakes in the Assertions of the Ancients about Matters not done in their own Times, but several Ages before they were born. For the Ancients did not live all in one Age;

and though they appear all under one Denomination, and so as it were upon a Level, like things seen at a vast Distance, to us who are very remote from the youngest of them; yet, upon a nearer View, they will be found exceedingly remote some from others; and so as liable to Mistakes, when they talk of Matters not transacted in their own Times, as we are when we reason of Matters of Fact, which were acted in the Reign of *William the Conqueror*. Wherefore, if one reflects upon the Alteration which Printing has introduced into the State of Learning, when every Book once printed, becomes, in a manner, out of danger of being lost, or hurt by Copiers; and that Books may be compar'd, examin'd and canvass'd with much more ease than they could before; it will not seem ridiculous to say, That *Joseph Scaliger*, *Isaac Casaubon*, *Salmasius*, *Henricus Valesius*, *Selden*, *Usher*, *Boschart*, and other Philologers of their Stamp, may have had a very comprehensive View of Antiquity, such a one as Strangers to those Matters, can have no Idea of; nay, a much greater than, taken all together, any one of the Ancients themselves ever had, or indeed, could have. *Demosthenes* and *Aristophanes* knew the State of their own Times better than *Casaubon* or *Salmasius* :

masius : But it is a question whether *Boethius* or *Sidonius Apollinarius* knew the State of *Demosthenes's* Time so well ; yet these also are Ancients to us, and have left behind them Writings of a very estimable Value. Literary Commerce could not anciently be so frequent as now it is, though the *Roman Empire* made it more easie than otherwise it could have been.

In *Ecclesiastical Antiquity* this can be more fully proved than it can in *Civil* ; because Monuments of that Kind are more numerous, and have been better preserved. How widely were the *Greek Writers*, many times mistaken, when they gave an Account of the Affairs of the *Latin Churches*. And how imperfect, many times, were the Accounts which the *Western Churches* had of Things of the greatest Moment, that had been determined in the *East* : Though the Council of *Nice* was Oecumenical, yet the *African Churches* knew so little of its Canons above $\overline{\text{U}}$ Years after it was held, that the Bishops of *Rome* imposed Canons made in another Council, held several Years after, in another Place, upon them, as Canons made in the Council of *Nice* : Yet they were all, at that time, under one common Government, and these things were

were acknowledged by all Sides to be of Eternal Concernment. The same Negligence, if not greater, is discernible in Matters which were studied, rather as Recreation and Diversion, than as necessary Business. How many of the Ancients busied themselves about Examining into the Antiquities of several Nations, especially after the *Old Testament* was translated into *Greek*? Yet, how few of them understood the Languages of those Countries of which they disputed. There were but Two of the Ancient Fathers, that we know of, that pretended to Learning, who understood *Hebrew* accurately; *Origen*, and *St. Hierom*. And how well *St. Hierom* understood it, is now certainly known; not like the *Lightfoot's*, the *Buxton's*, the *Drusius's*, and the *Cappell's* of the present Age, one may be very well assured. The other *Oriental Languages*, even these Inquisitive Fathers knew little or nothing of. To how good Purpose they have been cultivated by the Moderns, the Writings of *Selden*, *Bachart*, *Pocock*, and several others, do abundantly declare. When *Pocock* and *Golius* went into the *East*, to bring away their Learning, they went to excellent Purpose indeed. The *Bodleian* and *Leiden Libraries* can witness what vast Heaps of

Eastera

Eastern MSS. have been brought, by such Men as these, into Europe. One would think I were drawing up a Catalogue, not writing of a Discourse, if I should enumerate the Books which have been printed about the Oriental Learning, within these last LXX Years: And how much they have enlightened all manner of Antiquity, is easie to tell.

How clearly has the Old Chronology and Geography been stated by Modern Critics and Philologers; and the Mistakes and Carelessness of many Writers detected, who were esteemed Authentic even in the Times wherein they lived? Selden and Bochart, to name no more at present, have plainly proved, that all the Ancient Greek Antiquaries were not near so well acquainted with the Originals of that Mythology, which then made up a good part of their Religion, as well as of their Learning, as they are known at present, since the Languages of those Countries, from whence most of those Fables and Stories took their Original, have been carefully examined, and critically studied. Is it not a very odd thing, that of so many as have written of the Pyramids, there should not be one exact Account of them, Ancient nor Modern, till Mr. Greaves described them? They

(1) *Barba-
ra Pyrami-
dum fileat
miracula
Memphis.
Martial.*

They were admired formerly, as much as now (2); reckoned amongst the Seven Wonders of the World; and mentioned from *Herodotus's* Time, downwards, by all that gave any Account of *Egypt*. Yet most Men copied after *Herodotus*; and many of the rest, who did not, spoke by guess. None of the extant Ancient Authors was so Exact as Mr. *Sandys*, who wanted nothing but Mathematical Skill, to have left nothing for Mr. *Greaves*, who came after him, to do. This is an eminent Instance, whereby we may give a certain Judgment of the Historical Exactness of the Ancients, compared to that of the Moderns. It may be improved to considerable Purposes; at least, it is of great Use to justify those Modern Writers, who have, with great freedom, accused some of the greatest of the Ancients, of Carelessness in their Accounts of Civil Occurrences, as well as of Natural Rarities; and who have dared to believe their own Reason, against the positive Evidence of an old Historian, in Matters wherein one would think that he had greater Opportunities of knowing the certain Truth, than any Man that has lived for several Ages.

But here I expect it should be objected, That this is not to be esteemed as a Part

of Real Learning. To pore upon old MSS. to compare various Readings; to turn over *Glossaries*, and old *Scholia* upon Ancient Historians, Orators and Poets; to be minutely critical in all the little Fashions of the Ancient Greeks and Romans, the Memory whereof was, in a manner, lost within \bar{E} or a \bar{C} Years after they had been in use; may be good Arguments of a Man's Industry, and Willingness to drudge; but seem to signify little to denominate him a great Genius, or one who was able to do considerable Things himself.

The Objection is specious enough, and the Indiscretions of many Modern Commentators have given but too much Colour for it; which has, in our Nation especially, been riveted in Men's Minds, more, perhaps, than in any other learned Nation in *Europe*: Though in Enquiries into the remotest Antiquities of the oldest Nations, perhaps no People have done near so much as some learned *Englishmen*. But this Objection lies chiefly against the Men, not the Knowledge, the Extent whereof it is only my Business to enquire into; and yet, even there too, it is without Ground: For, whoever will be at the pains to reflect upon the vast Extent of the various Knowledge which
such

such Men as those I named before have gathered together, which they were able to produce to such excellent Purposes in their Writings, must confess that their *Genius's* were little, if at all, inferior to their *Memories*; those among them, especially, who have busied themselves in restoring corrupted Places of Ancient Authors. There are Thousands of Corrections and Censures upon Authors to be found in the Annotations of Modern Critics, which required more Fineness of Thought, and Happiness of Invention, than, perhaps, Twenty such Volumes as those were, upon which these very Criticisms were made. For though, generally speaking, good Copies are absolutely necessary; though the Critic himself ought to have a perfect Command of the Language and particular Style of his Author, should have a clear Idea of the Way and Humour of the Age in which he wrote; many of which things require great Sagacity, as well as great Industry; yet there is a peculiar Quickness in discerning what is proper to the Passage then to be corrected, in distinguishing all the particular Circumstances necessary to be observed, and those, perhaps, very numerous; which often raise a judicious Critic as much above the Author upon whom he

he tries his Skill, as he that discerns another Man's Thoughts, is therein greater than he that thinks. And the Objection that is commonly made against Editors of old Books, That every Man cries up his own Author, beyond all that have ever written upon that Subject, or in that Way, will rarely hold of truly great Critics, when they pass their Judgments, and employ their Thoughts upon indifferent Books; since some have taken as much pains, in their Critical Annotations (a), to expose Authors who have had the good luck to be exceedingly commended by learned Men, as ever others did to praise them.

(a) Vid. Petri Cunnazi Animadversiones in Nonni Dionysiac.

Soon after Learning was restored, when Copies of Books, by Printing, were pretty well multiplied, Criticism began; which first was exercised in setting out Correct Editions of Ancient Books; Men being forced to try to mend the Copies of Books, which they saw were so negligently written. It soon became the Fashionable Learning; and after Erasmus, Budæus, Beatus Rhenanus, and Turnebus had dispersed that sort of Knowledge through England, France, Germany, and the Low-Countries, which before had been kept altogether amongst the Italians, it was, for about CXX Years, cultivated with very

very great Care : And if since it has been at a stand, it has not been because the Parts of Men are sunk, but because the Subject is, in a manner exhausted; or at least, so far drained, that it requires more Labour, and a greater Force of Genius, now to gather good Gleanings, than formerly to bring home a plentiful Harvest; and yet this Age has produced Men who, in the last, might have been reckon'd with the *Scaligers*, and the *Lipsius's*. It is not very long since *Holstenius*, *Bechart*, and *Gerbard Vossius*, died; but if they will not be allowed to have been of our Age, yet *Isaac Vossius*, *Nicolas Heinsius*, *Frederic Gronovius*, *Ezekiel Spanheym*, and *Grævius*, may come in; the two last of whom are still alive, and the others died but a few Years since. *England*, perhaps, cannot shew a proportionable Stock of Critics of this Stamp. In *Henry VIIIth*'s Time there was an admirable Set of Philologists in the Nation; though there is a great difference to be made between a good Critic, and a Man that writes *Latin* as easily and correctly as his Mother-Tongue. *Sir Thomas More*, *Cardinal Pole*, *Linacre*, *Collet*, *Cheek*, *Ascham*, and several more, often to be met with in *Erasmus's Epistles*, wrote *Latin* with a Purity that no *Italian* needed then

to

to have been ashamed of. Let the Subject they wrote upon have been what it would, one may see by the Purity of their Style, that they wrote in a Language which express'd their Thoughts without Constraint. A great Familiarity with the politest Authors of Antiquity, was what these Men valued themselves much upon; and it was then the Delight of the learned Men of this Nation, as much as their Disputes in Religion would give them leave. Though this seem'd to sink by degrees, yet that afterwards Critical Skill in Antiquity was valued and pursued by our greatest Scholars, will not be questioned by those who consider what Sir Henry Savile, Mr. Camden, Archbishop Usher, Mr. Selden, Sir John Marsham, Mr. Grotius (not to mention some now alive, whose Fame will one day equal that of the Salmasius's and the Grotius's of other Nations) were the Glories of our Country, as well as of the Age they lived in.

In short, to conclude this Argument: Though Philological and Critical Learning has been generally accused of Pedantry, because it has sometimes been pursued by Men who seem'd to value themselves upon Abundance of Quotations of Greek and Latin, and a vain Ostentation

of diffused Reading, without any thing else
in their writings to recommend them;
yet the Difficulty that there is, to do any
thing considerable in it, joined with the
great Advantages which thereby have ac-
crued to the Commonwealth of Learning,
have made this no mean Head upon
to commend the great Savacry, as well as
Industry of these late Ages.

Disputes in Religion would give them
leave. Though this seemed to link by

degrees, yet that afterwards Critical
shall in a little while be pursued

in our greatest scholars, will not be
Of *Theological Learning*

The Moderns

Philology, I Before added DM.

Why, and, as I hope to prove, not
without Reason. As they relate to our

Question, they both agree in this, that
the Subject of them both is truly An-
cient; and that it is impossible to become

truly excellent in either of them, without
a familiar Conversation with those Ori-
ginal Books, to which the great Masters

of both these Sciences do constantly re-
peat. Our Blessed Saviour did not reveal

his Law by halves to his Apostles, nor
the New Testament an imperfect Rule of

Faith:

Faith: The *Old Testament* likewise has constantly been at hand; and the *Jews* have ever since their Return from the *Babylonish Captivity*, been scrupulously solicitous to deliver the *Genuine Hebrew and Chaldee Text* of the *Old Testament* pure and uncorrupted, to succeeding Ages. Yet, though these, together with the Writings of the *Greek and Latin Fathers*, be Instruments without which no Divine can work; and though it seems almost impossible that any Man should be able to perform all the Duties of his Profession, that are incumbent upon him as a Scholar, without a competent Exactness in all these Things; yet it is very possible that Modern Divines, who make use of these Instruments, may be better Work-men than those Ancient Fathers, who furnished them with the greatest part.

Now, that there may be no Disputes about Terms misunderstood, it will be necessary to explain what is here meant by a *Perfect Divine*; that is, to say, such an one as may be a Standard whereon to found a Comparison. A *Perfect Divine* ought to understand the Text of the *Old and New Testament* so exactly, as to have a clear Notion of every Book in general, and of the Grammatical Meaning of every Text in particular; that so he may be

able to reconcile all Difficulties, and answer all Objections that may arise: He ought to understand the State of the Church, as to its Doctrine and Discipline, in its several Ages: He ought to be thoroughly vers'd in all the General Notions of *Ethics*, taken in their utmost Extent, to enable him to resolve such Cases of Conscience as may occur, with Judgment and Satisfaction: He ought to be a Master of all the Topics of Persuasion which can ever lie in his Way, that so his Exhortations may please and convince those whom he designs to persuade at the same time: Last of all, He ought to be able to Answer all the Objections which may be, or have been raised against the Doctrine and Discipline of the Church, by its open or secret Enemies. These seem to be the necessary Qualifications of a *Perfect Divine*; it may, perhaps be question'd whether any Man did ever fully come up to this Description; neither is it necessary to the present Purpose that any should, since the Question will be as perfectly answered, by determining who have come the nearest to it, as by assigning any particular Person that ever quite reach'd up to it. For these Differences do not lie in a Mathematical Point, and I do not desire that any Disputable Things should ever

ever be brought under Debate. One Qualification, indeed, and that the most valuable of all, I have omitted; but that relates not to the present Controversie, since we are not now enquiring who were the Holiest Men, but who were the Greatest Masters of their Professions, the Ancient Fathers, or the Modern Divines.

The first thing required, is, an *Exact Knowledge of the Text of the Old and New Testament*. In Understanding the *Old*, even the *LXX* Interpreters themselves have often failed, as has been abundantly proved by Modern Critics. The Copies they used were sometimes faulty; and since they did not mend those Faults, it is more than probable they did not see them. It has been observed already, That scarce any of the Fathers understood *Hebrew* besides *Origen* and *St. Hierom*, who therefore were followed as Oracles by many of their Successors; even that alone will not suffice, because there are no other Books besides the *Old Testament* written in that Language: For which Reason, *Syriac*, *Chaldee*, *Samaritan* and *Arabic*, have been studied by Modern Critics; not to mention the Writings of the *Rabbins* and the *Talmudists*, to which the Ancients were utter Strangers. If we come to Particulars; Who of the An-

(4) Sec
Mr. Dod-
well's Two
First Dis-
tinctions
upon St.
Augustine

cients ever unravelled the Chronology of the *Old Testament*, like Archbishop *Usher*, and Sir *John Marsham*? Though *Eusebius's Chronicle* is a standing Evidence how much he, and *Julius Africanus* before him, endeavoured to clear that Matter, which was of so great Use to confound the vain Pretences to Antiquity of those other Nations that were so unwilling to yield to the *Jews* in this Particular. Who has ever given so rational and so intelligible an Account of the Design and Intent of the several Parts of the Ceremonial Law, as Dr. *Spencer*? Who has acquainted the World with the Geography of *Genesis*, or the Natural History of the Bible, like Monsieur *Bechart*? These are much harder things than the lengthning of a fine-spun Allegory, or than a few Moral Reflections, which constitute the greatest part of the Ancient Comments. But the *New Testament*, it will be said, was written in a Time that was nearer at hand; and so was certainly better understood. Without doubt it was, by the First Fathers; for which Reason their Interpretations (b) and their Reasonings, if we could have recovered, many of them would have been of infinite value: But when once the Synagogue and the Church broke off their Correspondence, when once

(b) See Mr. Dodwell's Two First Dissertations upon St. *Arenæus*.

once the immediate Reasons of the first Establishment of many Parts of the Christian Discipline, and of great numbers of Allusions to Jewish Customs and Traditions which are to be found in the *New Testament*, could only be known by Study and Reading, all which the first Christians knew without Study, as we do the Manners and Fashions of our own Age and Country, then the ancient Interpretations of the *New Testament* began to fail; and though some of them, St. *Chrysostom's* and *Theodoras's* especially, are in themselves, setting Antiquity aside, truly valuable: yet, for want of such a diffused Knowledge of Eastern Antiquities as was necessary, and which only could be had by a long Conversation with the Books that are written in those Languages, these admirable Commentators seem in several Places not to have found out the true Original of many things in the *New Testament* which have been discovered since.

To the next thing, which is Skill in *Ecclesiastical Antiquity*, I have spoken already. The *Third* and the *Fourth*, which relate to a Divine, as a *Casualist*, or as a *Preacher*, may be considered of together; wherein we of the present Age may, without Vanity, boast of having the best

Books, and of them too the greatest Numbers, upon these Subjects, written in our own Language, and by our own Countrey-men, of any People in the World. The Excellency of a *Casualist*, is, to give such Resolutions of Doubts and Questions proposed to him, as may both suit with the particular Circumstances of the Person who desires Satisfaction; and also may be perfectly agreeable to the Law of God. A *Preacher* then seems to perform his Office best, when he can at once instruct and move his Auditors; can raise their Passions, and inform their Judgment; that so every Sermon upon a Doctrinal Head, may contain the Solution of a Case of Conscience. For the first of these; It is certain, that many of the ablest of the Ancient Fathers were very excellent *Casualists*; as, indeed, every Man who has a right Judgment, an honest Mind, and a thorough Acquaintance with the Design of our *Blessed Saviour*, revealed in the Gospel, must of necessity be. And if, at this distance, many of their Decisions seem over-severe, there is as great, at least, if not greater Reason to suspect, that the Complaints now-a-days raised against them, may arise from our Degeneracy, as from their unwarrantable Strictness. But for the *Ancient Way of Preaching*, there

(L) See
Vol. D.
p. 12. Two
First Ed.
itions
of the
Book.

there is much more to be said. The great Handle by which an Hearer is enabled to carry along with him a Preacher's Arguments, is, Method and Order. Herein the Ancient Homilists are exceedingly defective: Flights of Rhetoric, which are more or less judiciously applied, according to the Abilities of the several Preachers, make up the greatest part of their Discourses: And, after *Origen*, most Men busied themselves in giving the People Allegorical Interpretations of Passages of Scriptures; which were infinite, according to the Fancies of those that used them. *St. Chrysostom*, indeed, reformed this Custom in the *Greek Church*: His Authority went a great way; and his Interpretations were almost always Literal, and, suitably to his vast Genius, very Judicious. But he that considers *Preaching*, as an Art capable of Rules and Improvement, will find a mighty difference between a Just, Methodical Discourse, built upon a proper Text of Scripture, wherein, after the Text is carefully explained, some one Duty or Doctrine of Religion, thence arising, is plainly proved by just and solid Arguments, from which such Topics of Persuasion are drawn at last, as are the most likely to raise such an Affection, and engage those Passions in the Minds
of

of all the Auditors, as will please and move Good Men, and silence, at least, if not persuade the Bad; and between a Loose, Paraphrastical Explication of a large Portion of Scripture, ending at last in a general Ethical Harangue, which is the usual Method of most of St. Chrysostom's Homilies. Whereas by the former Method, strictly followed, many of our *English* Sermons, especially of the Great Men of our own Church, since the Reformation, are Solutions of the most difficult Questions in Divinity, and just Discourses upon the several Duties of the Christian Life; and this with so much Smoothness, so great Beauty of Language, and such a just Application of the greatest Ornaments of True and Masculine Eloquence, to Things at first View, oftentimes, the most opposite, that the Hearer takes a Pleasure to think, that then he is most instructed, when he is best pleased. The Want of this Method in the Ancient Homilists, is the great Reason why they are so little read. It is not because they are hard to be understood; for an indifferent Skill in *Greek* and *Latin* is sufficient to go through with the greatest part of them; But Want of Method, great Multiplicity of Words, and frequent Repetitions, tire out most Readers: They know

not

not how far they are got, but by the Number of the Leaves; and so having no Rest for their Minds to lean upon, when once they begin to be weary, they are soon disgusted. If therefore these Inconveniences are, in a great measure, avoided by Modern Preachers, their Sermons are, in their kind, more perfect, though the Matter which both of them work upon be the same. And if these Things be the Effects of great Study, and of an exact Judgment, at least in those who contributed the most to so great an Alteration; then this also may come in as a proper Evidence of the Encrease of Modern Learning; and with much more Reason than those Things which only tend to divert a Man, when he is unfit for serious Business. Who those are who have succeeded the *Hookers*, the *Chillingworths*, the *Sanderfons*, and the *Hammonds* of the last Age, to such excellent purpose for the present, and those that shall come after, I need not name; but shall rather conclude with that Saying in *Velleius Paterculus*, upon a not much unlike Occasion; *Proorum ut admiratio magna, ita censura difficilis est.*

The last thing which I mention'd, as necessary for a Divine, is, *To be able to Answer such Objections as have been, or may be*

be raised against the Christian Faith. Of the Controversies which have arisen among Christians, and the Adversaries with whom they have been obliged to engage, there are in the present Account two Sorts; those which the Ancient Fathers were concerned with, and those that have appeared since. Of the latter it may, possibly, seem hard to pass a Judgment, since one cannot well say how Men would have managed Disputes which never came in their way. The former may also be subdivided into those which have been renewed in our own Time; and those of which we have only the Memory in Ancient Books. So that one is rather to consider how Controversies were handled in general, and so infer how these Modern ones, which have only engaged the Wits and Passions of later Ages, would have been managed, had there been an Occasion.

It is evident, that in their first Disputes with the *Gentiles*, the old Apologists did with great Accuracy expose both the Follies of their Worship, and the Vanity of their Philosophy: They opened the Christian Religion with great Clearness; they shewed the Grounds of their Belief, and proved its Reasonableness upon such Principles as were both solid in themselves, and

and suitable to the Ways of Arguing, and the peculiar Notions of all their several Adversaries. Afterwards, when the Mysteries of the Christian Religion were so eagerly debated, in Ages wherein they feared no Foreign Force, the Men of Learning shewed as great Subtilty in their Arguments, and as great Dexterity in shifting off the Sophisms of their Opponents, as have ever been shewed in later Times. So that thus far the Moderns seem to have little Advantage: And, indeed, the Books that were written by the Ancients in Defence of the Christian Religion, were very admirable: But in the Controversies that were managed amongst themselves, there seem to be, many times, as visible Signs of too great a Subtilty, as of a judicious Understanding of the Point in hand: They used little Method in ranging their Arguments, and rarely stated the Question in plain and short Terms: This made them often multiply Words to a tedious length, which both tired the Readers, and darkned the Dispute. That all these Faults are too often found in the Polemical Discourses of the Moderns, is most certain: But Comparisons are always laid between the ablest Men of both Sides. The Modern Defences of the Doctrines of the *Trinity*, and the *Incarnation*, may

may be compared with the old Defences of the same Doctrines against the *Arians* and other Ancient Heretics. If Heretics may be compared with Heretics, there is no question but the *Schismatics* are much abler Disputants than the *Arians* and *Emenians* were of old: They have collected every thing that can look like an Argument; they have critically curialed every Text of Scripture which anciently was not so Grammatically understood as now it is, and have spared no Pains nor Art to wrest every thing that, with any Show of Reason, could be drawn to their Side. They have refined upon the Philosophical Notions of God, and of his Attributes, and have taken great Care not to confound their Readers, or themselves, with Want of Method, or a Multiplicity of Words. Such able Adversaries have not failed of as able Opponents. And when Men of Skill manage any Dispute, whatsoever it be, they will teach one another the Art of Reasoning, even though beforehand they should not well have understood it, if their Debates continue to any length. Whence also it has followed, that though these Great Men, who have defended our Faith against such subtle Adversaries, would have shown their Skill equally upon any other Subject which they might have under-

considered; yet upon these Questions the Truth would otherwise never have been so perfectly known. And here it ought to be observed, That the Art of making Controversies subtle and intelligible; even though the Arguments should be all the same that had formerly been urged, shews much greater Skill, and a more thorough Understanding of those Matters, than had been discovered before. For, he that makes another understand a thing in few words, has a more clear and comprehensive Knowledge of that thing, than another Man who uses a great many. Such a Man's Expressions, if he has a mind at any time to go out of the way, or to enlarge, for the sake of those who love to have things expressed in an Homotetical manner, will never tire, because, having his Point all in view, he will take care that his Readers or Auditors shall always know where he is. Hence it is, that there are many Sermons in our Language, upon the most obscure Questions in the Christian Religion, wherein English Readers who have never read Fathers nor Schoolmen, whose Heads have never been filled with Terms of Art, and Distinctions, may come, without a distinction, may both in few and clear Propositions

positions know what they are to believe and at the same time know how to defend it. Hereby, in all our Controversies with *Papists*, *Socinians*, and *Dissenters*, many admirable Discourses have been written, wherein one sees the Questions rightly stated, properly brought in at Head, and accurately proved by such Arguments as its particular Nature may require. It cannot be denied, but a good deal of this Methodical Exactness was first owing to the School-men; but they are Moderns here. And if their Writings have some Excellencies, which the elegant Composites of more learned Ages with this also affords us a convincing Argument, that Mankind will, in something or other, be always improving; and the Men of working Heads, what Subjects soever they handle, though they live in Times when they have none but barbarous Patterns to copy after, will do many things which politer People did not know or else over-look'd.

Upon this Occasion, I cannot but take notice, that the Moderns have much clearer and shorter Institutions of all manner of Arts and Sciences, than any of the Ancients have left us. I have already instanced in the Method wherein all the Parts of Natural History have been introduced:

direct. It is evident, That Method in all
 these Things, must be the Effect of a
 Comprehensive Knowledge of the Bodies
 to be managed, and of a Nice Comparison of
 every several Body and Animal one with
 another, since otherwise their mutual Dis-
 crepancies and Agreements cannot possibly
 be adjusted, in the same has been done in
 Medicine and Surgery, in Anatomy, in Chy-
 mistry, in all Parts of Physics and Mathem-
 atics. How confused many times, and
 always, in, are Galen's Anatomical Dis-
 courses, in his comparison of *Rossetti's*,
Deventer's, and *Galen's*. Monsieur
Perrault has observed already, (c) that
Arbuthnot expressed himself so obscurely in
 his *Physical Discourses*, that his Meaning
 is almost as variously represented, as there
 have been Commentators who have writ-
 ten upon him, whereas no Man ever
 doubted of the precise Meaning of the
 Writings of *Des Cartes* and *Robins*, tho'
 all Men are not of their Opinion. In
Mathematics the thing is yet more visible.
 How long and tedious are *Euler's* Demon-
 strations, either in Greek, or as they are
 Commented upon by *Clavius*, in Com-
 parison of *Tacquet's* or *Barrow's*. A *Tacquet*
 has made *Astronomy* intelligible with a
 very little Help, which before was not to
 be attained without a Master, and shun-
 dance

NA (d)
 of boxes
 of steel
 to avoid
 the
 of the
 of the

(c) *Paralelle*
le des An-
ciens &
des Mo-
dernes; Di-
alog. III.
pag. 251,
— 257.

dance of Pedagog; the first and second
 done in the *Mathematical Part of the*
Enquiry in Practical Geometry, *Optics*, and
Catoptrics. The *Dioptrics* and *Catoptrics*
 done in the *Mathematical Part of the*
 date, in the *Dioptrics* are in long, and
 so perplexed, that they have not been
 tered all but *Pedagog* and *Geometria*. The
 Reasoner, who will have made himself
 his *Dioptrics*, of *Clavius* Book III, which
 is readily understood by any Man who
 read the first six Books of *Euclid*. The
 Abridgements give a good deal of Light
 and make the Knowledge complete to all
 who, (in the last Age) were so exceedingly
 furnished with the Theology of the
 School of these Studies, that they
 could make a formal Business of
Prælectiones upon these Mathematical
 and *Euclid's* first *Prælectiones* of the first
 Book of *Euclid*, which may be thoroughly
 comprehended by any Man of ordinary
 Parts, in two Hours time, by the use
 of *Dioptrics* and *Catoptrics* and the
 now of *Euclid's* upon the *Dioptrics* and
 tions, in Mr. Newton's *Mathematical*
Principles of Natural Philosophy. These
 die as Abridgements, and would be the
 crease of this part of Knowledge, for the
 last *Euclid's* is made good, and may
 be attributed, and though *Mathematical*
 dance

(2) An-
 nexed to
 the last E-
 ditions of
 Des Car-
 tes's Geo-
 metry.

(3) *Euclid's*
Elements
 of *Geometry*
 and *Trigonometry*
 with *Dioptrics*
 and *Catoptrics*
 by *Clavius*
 Book III.

and Compilers of Systems have common-
 ly the same fate to be undervalued by
 those who have been inventors themselves;
 yet, in Mathematical Sciences, the case
 is something different; for things cannot
 be abridged there, without a very exact
 knowledge of the Subjects then to be
 abridged, and brought into one view. In
Math. or *Historical Discourses*, an Epito-
 mized immediately sees what is either in-
 trinsically superfluous, or not to his particular
 purpose; and so when he has cut it off,
 what remains, is in some sort entire, and
 may be understood without the rest, so
 that there is no harm done. But here that
 will by no means suffice; for the most
 verbose Mathematicians have rarely ever
 said any thing for saying like, theirs
 being Subjects in which Figures of Rhe-
 torick could have no sort of place; but
 they made every Conclusion depend upon
 a Chain of Premises already proved,
 and if one Link were broken, the whole
 Chain fell in pieces; and therefore, he
 that would reduce those Demonstrations
 into a narrower Compass, must take the
 whole Proposition a new in pieces, must
 cut it several ways, must consider all the
 reasons which that Line, or that Solid,
 as to other Lines or Solids, must care-
 fully have considered: how many several

Ways it can be generated, before he can be able to demonstrate it by a shorter Method, and by other Arguments, than those by which it was proved before: In short, he must, in a manner, be able to invent the Proposition of himself, before he can put it into this new Dress, for which *Realon*, *Tacens*, *Barrow*, and *De Witt*, have been reckoned amongst the principal Geometers of the Age, as well as for their other Inventions in Geometry: *Johannibus Medicus* Menus will give a clear Idea of many things relating to this Matter.

And now, having gone through the several Parts of the Parallel which I proposed at first to make, I shall close all with *Sir William Temple's* Words, a little altered: (c) Though *Thales*, *Pythagoras*, *Democritus*, *Hippocrates*, *Plato*, *Aristotle*, and *Euclid*, may be reckoned amongst the first mighty Conquerors of Ignorance in our World; and though they made great Progresses in the several Empires of Science, yet not so great in very many Parts, as their Successors have since been able to reach. These have perceived so much more, than barely to learn what the others taught, or to remember what they invented; and being able to compass that it fell, have set up for Authors

themselves upon their own Stocks; and not contenting themselves only with Commenting upon those Texts, have both copied after former Originals already set them, and have added Originals of their own in many things of a much greater Value.

CHAP. XXX.

*Reflections upon the Reasons of the Decay of Modern Learning, as-
signed by Sir William Temple.*

HAVING therefore, as I hope, sufficiently proved, that there has not been such a Fall in Modern Learning, as Sir *William Temple* supposes, (though in many Particulars it may have fallen short of, and in others not out-done the Ancient;) nay, even that, comparatively speaking, the Extent of Knowledge is, at this Time, vastly greater than it was in former Ages; It may seem, perhaps, a needless thing to examine those Reasons which he alledges, of the Decrease of that, which in the gross has suffered no Decay. Something, however, I shall say

to them; because if they do not leave what *Sir William Temple* defines, they will prove at least what a poor thing Learning might have been. It had not met with such Impediments.

(f) P. 64,
65.

The first Blow which he says (f) that Learning received, was by the Disputes which arose about Religion in Europe, soon after the Revival of Learning in these Parts of the World. There is no doubt, but the Thoughts of many very able Men were taken up with those Controversies; who, if they had turn'd them with the same Application to Natural or Civil Knowledge, would therein have done extraordinary things. Yet, considering all things, it may be justly question'd, whether Learning may not, by these very Disputes, have received either immediately, or occasionally, a great Improvement, or at least, suffered not any considerable Diminution. For, (1.) It is certain, That whatsoever relates to Divinity as a Science, has hereby been better scanned, and more accurately understood and explained, than otherwise it would ever have been; and I suppose, this will be readily owned to be one of the most excellent Parts of Knowledge. (2.) It is a question whether a great many of the chiefest Promoters of any Part of this

Theolo-

Theological Knowledge, would, or could have done, so great things, upon any other Subject. Oppositions in general, which Men's Passions extremely; and that inward Satisfaction which a good Man gets, in thinking that he is employed upon Arguments of greatest Concern to the Souls of Men, inspires him with an Ardour that adds Wings to his native Ability; and makes him, in all such Cases, even out do himself. (13.) When different Parties are once formed, and great Numbers of Youth are constantly trained up, to meet the older Champions of their respective Sides; as these shall drop off, all those after-Corners will not apply their Minds to Studies immediately relating to their own Professions, but here and there one, as his Genius shall lead him, will try to excel in different Ways, for the Glory of his own Party; especially if he sees any of his Adversaries eminently Famous before him, in these things. Thus Petavius set himself to contradict Joseph Scaliger's Books de Emendatione Temporum, and Sciooppius set upon his other Critical Writings: While Isaac Casaubon concerned himself only with the Publishing and Commenting upon Arrian, Polybius, and Theophrastus, he was complemented by all Sides; but

when once he wrote against the Abuse of Cardinal *Bernius*, he met with numerous Adversaries; and there was found a Critic of the Church of Rome, for some time afterwards, that did not peck at something or other in his other Writings. This Emulation eminently appeared in the Order of the Jesuits, the main Design of whose Institution seems to have been to engross all Learning, as well as all Politics, to themselves; and therefore we see so many extraordinary Men amongst them for all sorts of things, thereby to give the World Occasion to think, that there must certainly be something more than ordinary in the Constitution of a Body, which every Day produced such excellent Persons. So that if one considers how far this Emulation went, which even yet is not wholly extinct, it is hard to say, whether Disputes in Religion have or rather helped to increase the Stock of Learning, than otherwise; at least one may venture to say, that they have not diminish'd it.

It is most certain, that the different Political Interests in Europe, have done it a mighty Kindness. During the Establishment of the Roman Empire, one Common Interest guided that vast Body, and the Western Kingdoms amongst the rest. Rome

was the Center of the Learning of the West, as well of their Hopes, and thither the Provinces of this Part of the World had always Resort. Whereas now every Kingdom standing upon its own Bottom, they are all mutually jealous of each others Glory, and in nothing more than in Matters of Learning in those Countries where they have Opportunities to pursue it. About an *CL*, or *CC* Years since, it was esteemed a very honourable Thing to write a true *Ciceronian* Style: This the *Italians* pretended to keep to themselves, and they would scarce allow that any Man beyond the *Alpes*, unless, perhaps, *Longolius*, and Cardinal *Pole*, wrote pure *Roman* Latin: This made other Nations strive to equal them; and one rarely meets with a Book written at that time upon a Subject that would bear the Elegancies of Style in bad Latin. When *Critical Learning* was in fashion, every Nation had some few Great Men at the same time, or very near it, to set against those of another: *Italy* boasted of *Carolus Sigonius*, *Fulvius Ursinus*, and *Petrus Victorius*; *France* had *Joseph Scaliger*, *Isaac Casaubon*, *Cojacius*, *Pirbæus*, *Brissonius*, and several more; *Switzerland* produced *Gesner*, for that and almost every thing else; *Germany* had *Leopoldus Gruter*,
Putschius,

Perfians, and others; the Low Countries had *Johannes Lipsius*; England had *Sir Henry Savile*; every Country had some Great Men to keep up its Glory in those things which then were in greatest request. In this last Age, *Mathematical* and *Physical* Sciences seem to have been the Darling Studies of the Learned Men of Europe; there also the same Emulation has been equally visible. When Great Britain could show such Men as my Lord Bacon, my Lord Napier (the Inventor of Logarithms) Mr. Harriot, Mr. Oughtred, and M. Flammsteed; Holland had *Stevinus*, who first found out *Decimal Arithmetick*, and *Sacculus*; France could reckon up *Des Cartes*, *Mersennus*, *Fermat*, and *Gassendi*; Italy had *Galileo*, *Toricellius*, and *Cavallerius*; Germany, *Kepler*; and Denmark, not long before, *Johannes Brahe*. When afterwards the Philosophers of England grew numerous, and united their Strength, France followed the Hint, and its King set up a Royal Society, to rival ours. The Duke of Tofany had set up already, at Florence, the *Academy del Cimento*, whose Members employed themselves in pursuing the same Methods. In Germany, an *Academy* of the same nature has been raised. Even Ireland has had its *Philosophical Society*. From all which such Swarms of Great Men in every

every Part of Natural and Mathematical Knowledge, have within these few Years appeared, that it may, perhaps, without Doubt, be believed, that if this Humour lasts much longer, and learned Men do not divert their Thoughts to Speculations of another kind, the next Age will not find much Work of this kind to do: For this sort of Learning has spread where ever Courts have had any Encouragement in Europe, so successfully, that, even the Northern Kingdoms have had their *Barristers*, their *Barrichtals*, their *Radpoks*, their *Warrisors*, and their *Miscellans*, who have put in for that Prize which the Inhabitants of warmer Climates seemed already in possession of. This has occasioned the Writing of abundance of Books, to vindicate the Glory of every great Invention to some eminent Man of that Country, that the Authors of those Books belonged to. Which Disputes, though many times very pedantically managed, and with an Heat misbecoming Learned Men, yet has had this good Effect, that while some were silent to secure the Glory of the Invention of Things already discovered, to their own Countries; others were equally solicitous to add a more undisputed Honour to them, by new Inventions, which

(e) P. 67,
— 71.

which they were sure no Man could possibly challenge. Another Reason of the Decay of Learning, according to Sir *William Temple* (g), is, the want of Protection from Great Men, and an insatiable Thirst after Learning, now grown the Humour of the Age. That Princes do not now delight to talk of Matters of Learning in their public Conversations, as they did about an hundred Years ago, is but too evident: When Learning first came up, Men fancied that every thing could be done by it, and they were charm'd with the Eloquence of its Professors, who did not fail to set forth all its Advantages in the most engaging Dress. It was so very modish, that the Fair Sex seem'd to believe that *Greek* and *Latin* added to their Charms; and *Plato* and *Aristotle* untranslated, were frequent Ornaments of their Closets. One would think by the Effects, that it was a proper Way of Educating them, since there are no Accounts in History of so many truly great Women in any one Age, as are to be found between the Years MD and MDC. This Humour in both Sexes abated by degrees; and the Great Men being either disgusted with the Labour that was requisite to become thoroughly Learned, or with the frequent Repetitions of the same

same things, Business and Diversions took up their Thoughts, as they had done formerly. But yet, in the main, the Learned Men of this Age have not so much reason to think themselves ill used, as it is commonly thought. What by Fellowships of Colleges, and Ecclesiastical Preferments, here in *England*; and by the same sort of Preferments, added to the Allowances in several Monastical Orders, in Popish Countries, there are very fair Settlements for Men of Studious and Sedentary Lives; and innumerable Instances can be given, in these two last Ages, of the excellent Uses which great Numbers of Men have made of them. So that every such Preferment bestowed upon any learned Man, upon the score of his Merit, by Princes, or Great Men, in whose Gift they were, is an Instance of their Beneficence to Men of Letters. And whether a Man is considered by a Pension out of a Princes Exchequer, or by the Collation of a Preferment in that Prince's Gift, it is, to a Man who enjoys it, the self-same thing. Neither have Examples been wanting in the present Age, of Sovereign Princes who have made it as much their Business to encourage Learned Men, as perhaps, in any of the former, that are so much commended, for that very Reason.

Christina
Queen

22.9 (6)

(1) 476

Queen of Sweden when in other respects
 was by no means the Glory of her
 did, which she lived in great boldness
 the learnedest Men of Europe to come
 to her, that she might converse with
 about those things wherein they were
 most excellent. *Deo Carolo, Samuel
 Bachel, Mikael Hagius, Jöen Pagan*, one
 of that number: And her Proficiency
 which knew no bounds, was never
 any thing more visibly than in her Love
 of Rapports to Men of Letters, to all
 wards, when she fed all her subjects
 in her always an Academy of the
 of the Crown. The picture of
 King, while Monarch of Sweden, was
 a singular Pledge in sending Princes and
 most celebrated Scholars of Europe, who
 one regarding whether they were his
 Subjects, or of his own Religion, or
 This he did partly for *Wit*, and partly
 (b) P. 68. ciples which *St. W. Main* *Frank* (a) is
 exceedingly supplied on his own
 said Subjects, before he invited them
 in the Common Ruins, and of his
 beauty of mind, and upon *Common*
 And whatever his other Actions were
 or *laudable*, yet his extraordinary
 Care to breed up his Sons to Learning
 his erecting of Academies for Arts and
 Science at *Uppsala*, and his frequent *Don*

ties to Men of Letters, justly require that
upon this Account, he should be mention'd
with Honours Cardinal de Rohan, Car-
dinal Mazarin, Monsieur d'Albret, and
Monsieur de Sully, though no Sovereign
Princes, yet his Power greater than many
Princes. Cassimirus Rostock was him-
self a Scholar, and all of them were emi-
nently Professors of Learned Men. I have
seen a Book, which was written by him, that
he once more observe, that it was
of Parts of our own, who founded the
ROYAL SOCIETY, and whose Studies, (i) P. 571
were not Prohibited, but encouraged
to be carried on, and the Academy of
Paris, the Academy of Histories, the Socie-
ty of the Garden of Epicurus, be-
cause they were neither written at the
same Time, nor for the most part upon
the same Subjects, yet will always help
to keep alive the Memory of that Prince
who incorporated them into a Body, that
they might the better do that by their
own Reasons, which might have
been in a manner impossible to be ef-
fect without the know-
ledge of Sir William Temple's Rea-
sons of the Decay of Modern Learn-
ing, and the Preamble of the Act, (i) P. 711
which is an evident Argument, that his
Reasons are not to be used against Learning,
not

ars, may, in this Particular, have done a great deal of good. By this means, and by the help also of some other concurrent Causes, those who were not learned themselves, being able to maintain Disputes with those that were, forced them to talk more warily, and brought them by little and little to be out of countenance at that vain thrusting of their Learning into every thing, which before had been but too visible.

E c C O N -

CONCLUSION.

THIS seems to me to be the present State of Learning, as it may be compared with what it was in former Ages. Whether Knowledge will improve in the next Age, proportionably as it has done in this, is a Question not easily decided. It depends upon a great many Circumstances ; which, singly, will be ineffectual, and, which no Man can now be assured, will ever meet. There seems Reason, indeed, to fear that it may decay both because Ancient Learning is too much studied in Modern Books, and taken upon trust by Modern Writers, who are not enough acquainted with Antiquity, to correct their own Mistakes ; and because Natural and Mathematical Knowledge, wherein chiefly the Moderns are to be studied as Originals, begin to be neglected by the generality of those who would set up for Scholars. For the Humour of the Age, as to those things, is visibly altered from what it was XX or XXX Years ago : So that though the

ROYAL SOCIETY has weathered the rude Attacks of such sort of Adversaries as *Stubbe*, who endeavoured to have it thought, That Studying of Natural Philosophy and Mathematics, was a ready Method to introduce Scepticism at least, if not Atheism, into the World: Yet the sly Insinuations of the *Men of Wit*, That no great Things have ever, or are ever like to be perform'd by the *Men of Gresham*, and, That every Man whom they call a *Virtuoso*, must needs be a *Sir Nicolas Gimcrack*: together with the public ridiculing of all those who spend their Time and Fortunes in seeking after what some call useless Natural Rarities; who dissect all Animals, little as well as great; who think no part of God's Workmanship below their strictest Examination, and nicest Search: have so far taken off the Edge of those who have opulent Fortunes, and a Love to Learning, that Physiological Studies begin to be contracted amongst Physicians and Mechanics. For nothing wounds so much as a Jest; and when Men do once become ridiculous, their Labours will be slighted, and they will find few imitators. How far this may deaden the Industry of the Philosophers of the next Age, is not easie to tell; for almost all the Parts of Mathematical and Natural

Knowledge require a good deal of Time and Pains, of Industry and Attention, before a Man can thoroughly relish them. And those who do not, rarely know their Worth, and consequently do very seldom pass a right Judgment upon them. However, be the Studies of the Men of the next Age what they will, the Writings of the Learned Men of the present Time will be preserved; and as they have raised a nobler Monument to the Memory of *Archimedes* and *Diophantus*, of *Hippocrates* and *Aristotle*, of *Herophilus* and *Galen*, by Improving their Inventions, than had been raised for a Thousand Years before; so some future Age, though, perhaps, not the next, and in a Country now possibly little thought of, may do that which our great Men would be glad to see done; that is to say, may raise real Knowledge, upon the Foundations laid in this our Age, to the utmost possible Perfection to which it can be brought by mortal Men in this imperfect state, and thereby effectually immortalize the Memories of those who laid those Foundations, and collected those Materials which were so serviceable to them in completing the noble Work.

But this is what every Man would gladly hope might be reserved for his own Posterity,

Posterity, and his own Country. How it may be reserved is obvious: It must be by joyning Ancient and Modern Learning together, and by studying each as Originals, in those things wherein they severally do most excell; by that means few Mistakes will be committed, the World will soon see what remains unfinish'd, and Men will furnish themselves with fitting Methods to compleat it: And by doing Justice to every Side, they will have Reason to expect, that those that come after them will do the same Justice to them, whenever they shall think fit to submit their Productions to public Censure.

F I N I S.